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HISTORY OF BOTANY—IN THE MOST PREMIER UNIVERSITY IN INDIA

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History of Botany—in the Most Premier University in India

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Published by the Registrar, University of Calcutta,
87/1, College Street, Kolkata-700 073
and
Printed by Dr. Aparesh Das, Superintendent,
Calcutta University Press
48, Hazra Road, Kolkata — 700 019

Regd. No. 2745B

Price : 500.00

To the memory of

The Founder Members of the Department

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Date February 23, 2015

MESSAGE

I take this opportunity to congratulate the Department of Botany for publishing the history of the Department as a part of the Department's Centenary Celebration. The Department of Botany, established in September 1913 under the leadership of Mr. C. C. Calder and at the initiative of Sir Asutosh Mookerjee, has remained in the forefront of India's research and teaching-learning processes in Botany and other related subjects. The Department's academic excellence has received both national and international acclaim. The University of Calcutta, the first modern University to be established in the subcontinent, was certainly established to promote colonial interest. But subsequently the University emerged as a focal point of Indian academic exercises in science, technology, social sciences, humanities, music and arts. In this context the Department of Botany has played a pioneering role in enabling the Calcutta University to create its required space in academic maps of India and of the world. It is certainly in the fitness of things that this academic record of the Department should be documented not only for the benefit of the present generation, but also for posterity.

The volume would not have, however, seen the light of the day without the initiative taken by Professor A. K. Sharma, whose leadership had provided a turning point in the Botany Department's continuous search for excellence. On my own personal behalf and on behalf of the University, I express my sincere gratitude to Professor A. K. Sharma for remaining a source of sustenance and support in the University's pursuit for making its motto – Advancement of Learning – a living reality.

Suranjan Das.
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Date 02 . 02 . 15

I am very glad to know that the Department of Botany, University of Calcutta is going to publish the history of its glorious 100 years as a part of their Centenary celebration programme. This department is one of the oldest Departments of this University. On September 1913, Department of Botany was established by Mr. C.C. Calder, as directed by the then Vice Chancellor, Sir Asutosh Mukherjee. At the time of inception very renowned personalities like Prof. S.P. Agharkar, Prof. P. Brühl, Prof. Sarbadhikari and other eminent academicians took the responsibility for all round development of this department in teaching and research. The department is continuing its journey giving full respect to its heritage successfully. I express my warm greetings and wish for all the success to the Department.

D Chattopadhyay

Pro Vice Chancellor
for Academic Affairs
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UNIVERSITY OF CALCUTTA
DEPARTMENT OF BOTANY

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Message

I am delighted to know that a book describing the History of our Century old department is being published soon. Our Department is the oldest department of this University with a glorious past. This unique concept of compiling the information of past and present personnel of different status of our department under a single cover was taken by our respected Sir, Prof. A.K. Sharma who initiated this process with great sincerity and enthusiasm. His untiring effort has made it possible to collect various data from different sources. Collectively, we have tried to compile nearly all the information about the department under his continuous supervision. Hope, this would be an extremely valuable gift to mark the Centenary year of the department and will serve as one of the most important documents for future generations of this department as well.

[Sandip Mukhopadhyay] 24/11/14

UNIVERSITY OF CALCUTTA
DEPARTMENT OF BOTANY

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It was a dream for us to celebrate the completion of hundred years of our Department under the guidance and leadership of our respected '**Sir**'– Professor Arun Kumar Sharma. We planned to observe this auspicious occasion in a befitting manner and organized several programs on academic, social and cultural dimensions, including the publication of the history of our Department in an audio-visual mode and in a book form. A year long program (2013-14) was celebrated including opening ceremony, Briksharopan, pleasure trip, sports and games, science day observation for school children, international-national seminars and workshops on different branches of Botany. We are extremely happy that almost all the programs ended with grand success and more than 1000 alumni members participated in different programs throughout the year in a very delighted and home coming feelings. We are extremely happy that after a strenuous effort we have been able to publish this book which will carry the history of our department for the future generations. I wish a brighter future and all-round development of our department in coming years (On behalf of Centenary Celebration Committee).

Ruma Pal
12.12.14.

ACKNOWLEDGEMENT

We acknowledge the contributions of all alumni, well-wishers and other personalities who contributed their sincere effort for compilation of this book.

PREFACE

Teaching of Botany began in the University of Calcutta in the year 1913, as far as the records of Senate show. During that period, Mr. C.C. Calder, the then director of the Royal Botanic Garden, mentioned that he had already admitted 14 students to the University. However the University records show, that 1st batch of students in M.Sc. came out in 1918. Evidently the students whom Mr. Calder referred to, were in the bachelor's course rather that their masters, because M.Sc. course needs only two years for degree.

Prof. Arun Kumar Sharma

After Mr. Calder stopped taking M.Sc. classes, Sir Ashutosh Mukherjee appointed Prof. S.P. Agharkar of Elphinston College, Bombay as the Rashbehari Ghosh Professor in Botany in the University. Just after joining in the post he was sent to Germany for obtaining Doctorate degree in Taxonomy with Prof. Engler, the famous taxonomist as well as the physiological anatomist Prof. Haberlandt, Prof. Agharkar had to stay up to 1918 in Germany for the degree as he was staying as intern in Germany because of the outbreak of 1st World War. Prof. Agharkar as such returned in 1920 and joined his post as Ghosh Professor. Before his return, he had to work in different parts of Europe for study of European plants and enriching the Herbarium at Calcutta.

During Prof. Agharkar's absence, Sir Ashutosh Mukherjee arranged for teaching in Botany by Prof. Hans Bruhl. Prof. Bruhl was born in Germany in 1855 and came to India in 1886 and joined Rajasthan College, now in Pakistan. In 1887, he was transferred to Sibpur Engineering College, as Professor in Engineering Science. During his stay at Sibpur he held different responsible positions and in 1912 he was awarded the degree of Doctorate in Science of Calcutta University. In 1913, he took charge of Registrar of Calcutta University and was also appointed as University Professor in 1880 in Botany. During his tenure, he organized the researches on algae, myxomycetes and mosses and phenograms. He had, in different subjects, a number of students and two of his disciples, Dr. K.P. Biswas, the Alglogist and taxonomist and Dr. J.C. Sengupta the plant physiologist attained international fame. Prof. Bruhl was a Fellow of the University of Calcutta and was closely involved in organizing the Royal Asiatic Society of Bengal. He was also the co-founder of Indian Botanical Society. The Department of Botany owes much to him. He was released as Head of the Department in 1928, and was succeeded by Prof. S.P. Agharkar.

Prof. Agharkar after joining the department thought of reorganizing it so that it had an all round development rather than specialization in one or two branches. As such he started at the initial stage to open different laboratories, viz., Embryology (Prof. I. Banerjee), Palaeobotany (A.K. Ghosh), Mycology and Pathology (S.N. Banerji). He himself taught taxonomy and Plant Geography. He had the boldness to open the section on Paleobotany as other than his own stream only. Later Prof. Birbal Sahni, was the person in Lucknow to open the department. The decision proved justified as Angiosperm origin could be traced to Precambrian according to Dr. Ghosh ,rather than Tertiary as thought by Prof. Birbal Sahni. Similarly the medicinal extract polyporin could be discovered in Mycology section from the genus *Polystictis sanguineus* of Polyporaceae. The Plant Physiology section showed that by proper treatment, the Aman variety of rice could be grown twice a year by photo period control. In the area of Cytology, a new technique on chromosome nucleolus relationship was worked out in the section of cytogenetics.

Leaving aside, the glorious past and activities as presented in the renaissance era, these subjects in modern times are continually proving productive, indicating science, as an important component of our life. Specially during the last fifty years, the developmental activities underwent radical changes. For the improvement of college teachers, the department undertook university leadership projects in which the teachers from different states and universities participated in Faculty improvement programs. Teachers from majority of states fully availed of all the facilities of improvement programs under the department involving collaboration with the universities both Indian and foreign ones. The Indo-British, Indo-Soviet and Indo-German programs have also been taken up by the teachers and researchers from both sides, sponsored by UGC, INSA and other funding agencies. Taken in account of the performance of the department, initially it was raised to Special Assistance Program by UGC and later in 1980 to *Center of Advanced Study in Chromosome Research.* The activities of all sections have underwent development with papers in high impact journals and books of international repute, coming up at regular intervals and published by foreign and Indian publishers.

The appointment of Prof. Agharkar by Sir Ashutosh Mukherjee was indeed a great event in view of the fact that his specialization was in Zoology (Malacology) as well as Botany and Geology. But his appointment was vindicated, as he developed the department very successfully. He believed in developing an all round of the department instead of one or two specialization as in others.

Even the selection of students at the initial stage was judiciously made by the fact that all of them became very successful in their professional life. Prof. K.D. Bagchi later developed Mycology section of Forest Research Institute (FRI) Dehra Doon and Prof. H.P. Choudhury built the Botany Department at Punjab. Similarly, the Paleobotany section worked out that the age of the modern angiosperms could be traced to Precambrian era and the modern plants are not necessarily tertiary in origin. Similarly, very important medicinal extract polyporin was extracted from Poloyparaceae fungi and the control of photoperiod led to double flowering of Aman variety of rice. All those evidences fully vindicated that decision Prof. S.P. Agharkar. Similarly it is also justified that the idea of Prof. Agharkar in opening the different disciplines of Botany as well as selection of teachers and primary batch of students were very judiciously done.

Thus from the performances of both the teachers as well as the students, Professor Agharkar proved beyond doubt his sense of judgment, which brought glory to the University in general and to this subcontinent in particular.

([illegible])

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Inception and Development

At Calcutta University, teaching Botany at graduate level was initiated on September 1913, by Mr. C.C. Calder, Superintendent of Royal Botanic Garden, as desired by the then Vice Chancellor, **Sir Ashutosh Mukherji**. Prof. S.P. Mahalanobis of Presidency College, Calcutta also helped in introducing this subject. It is worth mentioning that, Sir Rashbehari Ghosh- a distinguished alumnus of the university and a renowned lawyer donated huge grant to the University for the foundation of University College of Science, as well as for four chairs including one in Botany, related to Agriculture.

Prof. S.P. Agharkar visited Calcutta in November 1913, in relation to centenary celebration of Indian Museum and at that period working under Willium W.W. Smith FRS, on plant collection at Royal Botanic Garden, Sibpore. Sir Asutosh Mukherji appointed him to the chair Ghosh Professor of Botany in May 1914 and deputed him to Germany to specialize in plant taxonomy under Prof. Engler. He made an extensive collection of herbarium specimens to be ultimately utilized for the herbarium of the University of Calcutta. He started his work as Ghosh Professor in Calcutta University in July 1920 and since then he taught Systematic Botany and Plant Geography in Calcutta University. In earlier days he even taught Gymnosperm and Genetics and used to take students to field work till he retired. He was an all-round Botanist with a good vision for the development of the Department.

Sir Asutosh Mukherji also appointed **Prof. P. Brühl**, the then Prof. of Physics in Bengal Engineering College and registrar of the University of Calcutta, as Professor of Botany, University of Calcutta. He was confirmed in post Head of Botany in 1918, the position which he held till 1928. Prof. Brühl (D.Sc.) though basically a physicist made excellent contribution in the area of Algology and Mosses both being members of Cryptogams. During his tenure as Professor he produced among his students, – Professor K.P. Biswas and Prof. J.C. Sengupta– whose names need special mention.

Prof. Sarbadhikari succeeded Prof. S.P. Agharkar as 'Sir Rashbehary Ghosh Professor' of Botany, University College of Science, Calcutta. He was a former student of Late Sir J.B. Farmer at the Imperial College of Science and Technology, London. He obtained D.Sc. degree from Unviersity of London and obtained distinction in research. His contributions principally covered cytological work with important contributions to the Life history of Fungi, Pteridophytes and Angiosperms. In Pteridophytes his work on apogamy and apospory in *Osmunda* and *Doodea* earned him international acclaim. He retired from the service in 1953. Earlier, before joining the University he was in colonial service at Colombo and worked at Jodrell Laboratory at the Royal Botanic Garden, Kew, John Innes Horticultural Institution, U.K., with Prof. Baleson as well as in Paris with Prof. Guillermond. He was Professor of Botany at the University of Ceylon before joining the University of Calcutta.

Prof. J.C. Sengupta later became plant physiologist of international repute. He became head of the department of Botany and later Principal, Presidency College, Calcutta and finally Director Botanical Survey of India, Govt. of India. Prof. Sengupta's contributions in the area of plant physiology centered around osmotic value and water absorption of plant, both of tropical and temperate regions of India as well as mangrove vegetation of Sunderbans. He made detailed study on the effect of day length and temperature on the flowering of vegetable crops including Jute, soyabean and sesame. He also studied hormonal control of fruit set and artificial induction and natural efficiency as a factor in the growth and fibre content of jute. He received 'P. Brühl medal' of the Asiatic Society and became President of the Botanical Society of Bengal as well as Botany Section of Indian Science Congress. He died in January 21, 1969, while he was Emeritus Professor of Council of Scientific and Industrial Research in the Department of Botany, University of Calcutta.

The other student whom Prof. Brühl nurtured was **Dr. Kalipada Biswas** who later obtained D.Sc. degree in 1937 from the University of Edinburgh and became a renowned algologist.

During the silver jubilee session Science Congress at Calcutta 1938, **Prof. Agharkar** was entrusted with responsibilities of preparing a document of history of Botany in India which has also served as core materials of the present document. This document was later followed by P. Maheswari and R.N. Kapil who dealt with progress till golden jubilee session of the congress in 1963. These have been two successive documents viz. a decade of science on India covering the progress of Botany in the period of 1963-72 and a final one by B.M. Johri, two volumes on 'Botany in India', covering progress upto 1994. The volumes were edited by Prof. A.K. Sharma and Prof. B.M. Johri respectively.

Over and above the teaching responsibility, Prof. Agharker guided many important research programmes sponsored by ICAR on Mango and Banana, the other in Polyporaceae and Theleporaceae, finally on diseases on long staple cotton, financed by Bengal Millowners association.

During his long period of service Prof. Agharker developed the department in a desired way, so that all branches of Botany as far as possible could be attended to. He created sections on teaching and research in **Embryology, Cytogenetics, Mycology, Plant pathology** and his own specialization on **Taxonomy** and **Plant Geography** as well as Palaeobotany. This division in this university though new started to work on fossil microspores in addition to other aspects of fossil botany, it is indeed remarkable that these microspore itself paid very high dividend. On the basis of the study of the age of saline series, salt range, the origin of angiosperm could be traced to Precambrian rather than the tertiary, which was the accepted norm. In fact as there was no vascular evidence at Precambrian biota, Prof. Sahni still regarded angiosperm as tertiary origin and not convinced of Precambrian origin. However, evidences at the later stage of the vascular remains of angiosperm at Precambrian were obtained and the conclusion of A.K. Ghosh, Sen and others of Calcutta School were vindicated. Similar evidences were also obtained from other schools. When he joined the department, there was only one professor and one lecturer but at the time of his retirement, there were four assistant lecturers in addition to existing one Ghosh Professor and one lecturer. The Ghosh Scholars attached to the Ghosh Professor, were fully looked after by him, giving them the guidance. Their contribution enriched to a great extent, the plant science in India.

The embryology section led by Prof. I. Banerji taught a large number of students and developed a school. Later, cytogenetical works were carried out by Prof. P.N. Bhaduri during his masters course when he was working on embryology of species of *Solanum* under Dr. I. Banerji. The establishment of the section of Palaeobotany by S.P. Agharker in this department was also a bold step as excepting in Lucknow where Birbal Sahani worked, there were no other university dealing with Palaeobotany. These findings also justified Professor Aghakar's decision to establish a section of Palaeobotany in his Dept. of Botany, University of Calcutta. Similarly Prof. Agharkar at the initial level, took the decision of creating a section of Mycology and Plant Pathology with the appointment of Prof. S.N. Banerji as assistant lecturer. Another section of importance Plant Physiology, was established by Prof. Agharkar and he chose Prof. S.M. Sircar to develop the section.

At the beginning the physiology was principally concentrated at the Union Agricultural Research Institutes and the Provincial Agricultural Research Stations in India. It may however be admitted that the famous Bose Research Institute which was founded by Sir Jagadish Chandra Bose in Calcutta, where Plant Physiology was an important component. In fact, Prof. Sircar in 1935 published a paper on mitochondria and species of *Azolla* when plant biochemistry was in its infancy. During the initial phase even Prof. Sircar worked on protein synthesis in potato tuber, a very significant contribution of plant protein synthesis during that period. Later he worked extensively on vernalization and photo periodism. His study indicated that early flowering in rice can be achieved by short day treatment of seedlings of varying period. The degree of earliness for flowering increased with duration of treatment. His studies indicated that photoperiod sensitive Aman rice variety flowers twice a year which have greatly influenced the rice cultivation of West Bengal. This has been greatly benefitted Indian Agriculture.

Later Prof. Sircar joined as Director of Bose Insitute, he and his associates reported/ isolated hormones from water hyacinth and mangrove plants, both the works being of high practical value. Prof. Sircar became the General President of Indian Science Congress and Fellow of all the academics in India. Vice-President of International Botanical Congress and as Chairman of different bodies on Agriculture setup by Government of India.

The other section which came up during Prof. Agharkar's regime was the section of cytogenetics initiated by Prof. P.N. Bhaduri who had his training under Prof. I. Banerji, Head in Embryology and who initially kindled his interest in chromosome research through acetocarmine staining of cotton chromosomes at Indore. Prof. P.N. Bhaduri after joining the department left for abroad to work under Prof. R.R. Gates, FRS at Kings College, London, and returned in 1940 to develop the section of cytogenetics.

Of the divisions at the initial stage, mention be made that section of Mycology and Plant Pathology got the due attention of Prof. Agharkar.Activity of this department is very much enriched by Prof. S.R. Bose (Sahayram Bose) who made extensive studies on Polyporaceae of Bengal for many years. In later years the extraction of Polyporin from this family made it a very important medicinal group. Prof. Bose made detailed investigation also in several wood rotting fungi as well as sexuality of Basidomyceties. Later Dr. S.N. Banerji took the charge of the department in this university and published descriptions of Thiliporaceae and Hydnaceae of Bengal as well as made extensive collection of hard fungi. This department in later years had made extensive work of fundamental importance of host pathogen interactions.

The other section which was introduced in the M.Sc. course of this university was embryology, led by **Dr. I. Banerji**, products of this university. Dr. I. Banerji could attract large number of students who were trained in Embryology and actually speaking his school was next to the school at Delhi led by Prof. Mahaswari. Dr. Banerji in the meantime got trained in chromosome study at Cotton Research Institute at Indore and as such introduced cytology in his school.

A product of this school is **Prof. P.N. Bhaduri** who did his initial work on Solanaceae under Dr. I. Banerji and later left for England to work under Prof. R.R. Gates, the cytogenetisists under Patil Travelling Fellowship. On his return he opened a full fledged section of Cytogenetics. During his stay abroad he worked on chromosome technique as well as chromosome nucleolus relationship. It is still-now established as differential technique for chromosome nucleolus relationship. Prof. Bhaduri worked on cucurbits at Calcutta with his student, Dr. P.C. Datta and proposed the theory of fragmentation of chromosome as a physical basis of speciation.

Prof. A.K. Sharma who started chromosome research during his M.Sc. thesis, succeeded Prof. P.N. Bhaduri, as he left for New Delhi to join as Head of the Cytogenetics section in Indian Agricultural Research Institute in 1946.

The above description given so far is principally aimed towards the justification of Prof. Agharkar's choice of different sections which he did with full success. The varied lines of study, and later other achievements clearly indicated the wise decisions of Prof. P. Brühl and Prof. S.P. Agharkar at the formative phase of the department.

In addition to the above sections, three more sections were added at later, after Prof. Agharkar's retirement, namely–Ecology, Microbiology and Pharmacognosy.

1st Batch of Students :

It is a matter of great interest that the University of Calcutta ventured to open postgraduate in Botany with a very meager staff. The first batch of students came up in 1918, that is at a period when Prof. S.P. Agharkar, Ghosh Professor, Botany was in Germany and not present in the university. As compared to the present state of affairs in the university, one cannot visualize the postgraduate department has been running with only two staff possibly Prof. P. Brühl, acting registrar and Mr. C.C. Calder, Part time Director, Royal Botanic Garden, Calcutta. Of course, the help of Prof. S.C. Mahalanobis was acknowledged by Mr. C.C. Calder.

The first batch of students who passed included Mr. Krishna Das Bagchi, Sri Haraprosad Chaudhuri, Sri Kantigopal Banerji and Sri Sarojini Dutta.But the success of postgraduate teaching by a meager group of staff is reflected by the very fact of the performance of the students, viz **Sri Krishna Das Bagchi** became very famous by opening the Mycology division of the Forest Research Institute, Dehradoon which earned tremendous reputation on later years. Similarly **Sri Haraprosad Chaudhury**, became responsible for opening the Botany department of University at Ludhiana now in Pakistan. Mr. Parasuram Misra a product of the next batch (that is 1919) later became the Vice Chancellor of Utkal University, Sambalpur. Mention may also be made of **Kalipada Biswas** (1922), the algologist of international fame, became first Indian superintendent and later director of Royal Botanic Garden, Sibpore. Similarly, Atul Chandra Dutta of the same batch became the Head of the department of Botany of Cotton College, Gauhati. However, during this period Prof. Agharkar did rejoin the department after returning from abroad and appointed Dr. Ilabanta Banerji of the same batch as one of teachers of the university. Prof. Hemendra Chandra Mukerhji headed the Department of Botany, City College and Sri Ramendra Krishna Sarkar (1923) became the Head of the department of Botany in Asutosh College, Calcutta. This batch also produced another outstanding student **Dr. Jyotish Chandra Sengupta** of international fame in Plant Physiology who not only later became Head, Department of Botany and later Principal Presidency College, but ultimately became the Chief Botanist in Botanical Survey of India. **Dr. Sachindra Nath Dasgupta** (1925) became the Head of the department of Mycology, Dept. of Botany at Lucknow and Sri K. Rangaswamy joined the department of Botany, University of Bangalore.

The 1927, batch, included Dr. Balai Chand Kundu, who became the Director of Central Jute Research Institute and later in the Department of Botany, Presidency College. Dr. K. Krishnaswamy of the same batch (1927) ultimately became the chief conservator of forest at Bangalore.

Dr. Hiralal Chakraborty a product of 1930 batch, became UNESCO expert at the college of Ghana and later became Professor at Presidency College, Calcutta. Professor P.K. Sen of the same batch jointed the Agriculture department of the University of Calcutta, as Khaira Professor and Dr. J.S. Hedayetullah of 1928 batch became Head of Natural Products of Research Div., the Regional laboratory, Dhanmandi, Dacca.

The above mentioned Scientists who at later period held such prestigious positions throughout India bear testimony of the nature of teaching that was imparted to them by such a meager and devoted staff of the university at its formative stage.

Distinguished Professors Involved in the Development of the Department

Prof. C.C. Calder

Charles Cumming Calder (1884-1962) was a Scottish Botanist. He was born at Edinkille, Morayshire in 1884 and did his B.Sc. from the University of Aberdeen in the year 1908 and FLL degree in 1912. He came to India and served as the curator of the Herbarium of Calcutta Botanic Gardens from 1912 to 1923. During this period in 1913, he introduced B.Sc in Botany at Calcutta University as per desire of the then vice chancellor of Calcutta University, Sir Asutosh Mukhopadhyay. Afterwords he served as Director of Botanical Survey of India from 1923 to 1937 and also acted as superintendent of Cinchona cultivation in Bengal.

Some important publications of C.C. Calder—'*Hand book of common water and marsh plants of India and Burma*'-co-authored with Kalipada Biswas, 'The species of Oxalis now wild in India and a new Indian Vernonia' etc.

Prof. Puroshattam Shankar Agharkar (1884-1960)

Prof. Agharkar was born in Malvin in the Ratnagiri district of Bombay and studied botany and zoology at under graduate level, he obtained his master's degree in natural science in 1908. In 1910 he was appointed a lecturer and head of the biology department of Elphinstone College, Bombay, where he remained for two years. During this time he collected plants and animals from the Kayana and Venya valleys. Young Agharkar was fascinated by plants and animals of the Western Ghats. His hobby let him to discover jelly fish. He recorded his observations and information with meticulous details. His collections of fresh water sponges formed the basis of the publication later by N. Annandale (1911).

Impressed by these qualities, the Indian Museum at Calcutta offered him a research job. Agharkar used this opportunity to discover many types of plants that still carry his name. Recognizing his merit, Sir C.V. Raman recommended him for Sir Rashbehari Ghosh Professorship at Calcutta University. Prof. Agharkar was appointed 'Sir Rashbehari Ghose Professor of Botany' in 1914 and was deputed to Germany for further studies. Agharkar arrived in Berlin in May 1914, but it was an unfortunate time to be in Germany, as the First World War broke out in August and along with many other Indian students, Agharkar was interned as a civilian prisoner. Only when he was released under supervision in late 1917, he was able to resume his studies and finally able to work with eminent botanists such as Ludwig Diels, R.K.F. Pilger, G. Haberlandt and A. Engler. Agharkar was awarded his doctorate degree in 1919 and left Germany in December that year. Before returning to India he spent six months for touring other herbaria in Europe, working for some time at Kew, for collecting plants which formed the nucleus of the herbarium at the Calcutta University. He also collected plants in Nepal in 1921 and 1923.

Prof. Agharkar returned to the University in 1920. In 1929 he took complete charge of the Department after the retirement of Prof. Bruhl. From then onwards, Agharkar succeeded in increasing the number of members of the teaching staff for the different branches of botany, so that afterwards facilities for research in mycology, cytogenetics, physiology and palaeobotany developed.

Agharkar spent the next 26 years at Calcutta, settling in Poona (Pune) after his retirement. Here he organized the Maharashtra Association for the Cultivation of Science, of which he was Hon. Director until his death. Agharkar is also associated in the building of many research institutes.

A well-known morphologist, a thorough systematist and a keen plant geographer, he fought against a proposal to transfer valuable herbarium specimens from Calcutta to Kew and through his efforts Indian botanists were sent to Kew to work on Indian material already there. Agharkar made critical observations on the phenomenon of teratology in the plant kingdom. He recorded abnormalities in many flowers like *Musa superb* on the basis of an examination of over 2600 flowers. Initiating embryological studies on *Carica papaya*, he showed that the monoecious and dioecious forms of papaya have a similar development of embryo-sac. He also conducted cytological studies on the variation in chromosome numbers in Musaceae. He reviewed the status of knowledge at his time of the aquatic flora of India and the composition of the Bengal flora. His name is commemorated in two flowering plants (*Dicraeaa aghrkarii and Musa agharkarii*), one fungus (*Mitrula agharkarii*) and one centipede (*Cryporrhyptops agharkarii*).

Agharkar was honored with Professor Albert Seward Memorial Lecturership by Birbal Sahni Institute of Palaeobotany (1955). He became President of Indian Botanical Society (1923). President, Botany Section of Indian Science Congress (1924) and received Indian Science Congress Medal of Asiatic Society (1934). He was also a Member of Indian Society of Soil Science (Honorary Secretary, 1935-40); Botanical Society of Bengal (President, 1940-45); Indian Ecological Society (President 1940-45); Asiatic Society (Secretary, 1943-45; Vice-President, 1945-46); Brihan Maharashtra Parishad (President, 1943) and Maharashtra Sahitya Parishad, Pune. Agharkar was Secretary (1935-44) and Vice-President (1945, 1956-57) of INSA.

Prof. Paul Johannes Brühl (1855-1935)

Born and educated in Germany, Bruhl joined a botanical touring party after obtaining a travelling fellowship. He walked all the way through Central Europe, Asia Minor and Armenia. He worked as a teacher at Constantinople for some time. He reached India in 1881 and joined the Rajshahi College as a teacher of Natural Sciences. His interest in botany was known at this time and Sir G. King, the then Superintendent of the Royal Botanic Garden, Calcutta got him transferred to the Bengal Engineering College in 1887. There he taught various subjects like chemistry, physics, geology, heat engineering and agriculture. His research in botany during his off time continued and found expression in the voluminous publication "*A century of New and Rare Indian Plants*" in collaboration with Dr. King (1896). Most of the sketches of plates there in were Bruhl's own sketches. He retired from the Engineering College in 1912, and after a brief stay at the Indian Institute of Science, Bangalore and as a teacher in chemical geology and mineralogy at the Presidency College. At the request of Sir Ashutosh Mukherjee, he joined as the Registrar, Calcutta University in 1913 and acted concurrently as the Controller of Examinations and Secretary to the post graduate departments of arts and sciences which were just developing. However, subsequently he was entrusted to build up the biological laboratory for post graduate teaching. The palatial residential building of late Sir Tarak Nath Palit at Ballygunge was converted into the Biological Laboratory. Paul Bruhl was placed in charge of the Botany Department in 1914 as a Professor. He equipped it on a large scale in different branches of botany and initiated research work by students at the University. He was awarded the Doctor of Sciences (*Honoris Causa*). He established the nucleus of the herbarium in the department (CUH) by purchasing the duplicates of Walter Migula's collection of mosses representing a part of the cryptogamic flora of Germany, Austria and Switzerland.

His interest in plant systematics predated his joining the Calcutta University. While still at the Sibpur Engineering College, he published a very critical paper on "Recent Plant Immigrants" in Bengal and Bihar, which dealt with critical notes on each every plant so considered, their Bengali names and etymology. In it he also investigated the indigenous as well as the foreign elements, their representation in numbers and percentages and probable time of immigration. Even prior to that, he joined George King in publishing "*An account of the new and rare plants of India*". After joining the University, his interests broadened to other groups; he initiated researches on algae and published several papers with Dr. K.P. Biswas. He also worked on the Ranunculaceae, Orchidaceae (Guide to the Orchids of Sikkim) and grasses. Interestingly the only flora of Salt Lakes, Calcutta was published by him jointly with K.P. Biswas in 1927, long before it had been transformed into a new urban settlement. Dr. Bruhl also published a 'Census of Indian Mosses' in 1931.

Dr. Kalipada Biswas (1899-1969)

Dr. K.P. Biswas was one amongst the first batch of students who passed M.Sc. from this department. He was the Suprintendent of the erstwhile Royal Botanic Garden, Calcutta (presently—*Sir Jagadish Chandra Bose Indian Botanic Garden*) and later Director of Cinchona and other Medicinal Plants, Govt. of West Bengal, was an Honorary Lecturer in the department of Botany since 1940. In fact his efforts should be remembered for development of Botanical Survey of India also.

Though he used to teach algae at the M.Sc. classes, his influence, inherited from his teacher Prof. Bruhl, in the furtherance of taxonomic research in all plant groups led generations of students to get interested in taxonomy in general. His interest in the taxonomy of algae was influenced by Professor Bruhl of the university during his student days. They jointly published a number of papers including those of the algal flora of the filter beds (1922), new species of *Cylindrospermum* (1922), Taxonomy of *Compsopogon* (1923), Flora of the Salt Lakes (1927), Algae of the Loktak Lake (1929) etc. He collaborated with Dr. C.C. Calder, his predecessor as the Superintendent of the Botanic Garden and published the masterly '*Handbook of Common Fresh Water and Marsh Plants of India and Burma*' (1937). Algal flora of different locations and situations remained his passion. His extension of research led to the publication of '*Sargassum of Indian seas*' (jointly with A.K. Sharma, 1950). He made extensive collection of plants from India and neighboring countries which resulted in the publication of '*The distribution of wild conifers in the Indian Empire*' (1933), '*Glimpses of the vegetation of south Burma*' (1933), '*Some foreign weeds and their distribution in India and Burma*' (1934), '*Studies in ferns and fern-allies in Burma*' (1935) and '*Systematic position of common tree fern of the eastern Himalayas with a note on the genus Cyathea*' (1943). He even explored the lichens to publish '*Distribution of Indian lichens*' (jointly with D.D. Awasthi-1948). He had special interest in the plants of Sikkim Himalayas and his publications include, '*Common plants of northern Sikkim*' (1936), '*Common medicinal plants of Darjeeling and Sikkim Himalayas*' (1956), '*Plants of Darjeeling and Sikkim Himalayas*; (1966). He made vegetation studies of various places of Raniganj and Jharia coal fields (1934), Vindhya ranges and Panchmarhi plateau (1951), Eastern Sikkim (1952), Indian deserts (1952), and Strand vegetation of Bengal, Orissa and Madras (1955).

Dr. Biswas received the Coronation medal in 1937, Paul Johannes Bruhl Medal and Elliot Gold Medal in 1958, and was also awarded the Rabindra Puraskar (jointly with Ekkari Ghosh) for the book (in Bengali) Bharatiya Banaushadi (3 vols.). He was the President of the Indian Botanical Society in 1952, and the sectional President of the Botany Section of the Indian Science Congress in 1943. He was a Fellow of the Royal Society, Edinburgh, National Institute of Science in India, Society de Bronx, Paris and the Asiatic Society of Bengal.

Prof. Satyendra Nath Bal

Born in Mymensingha of present day Bangladesh in the year 1890. He completed his education in United State in 1910 being deputed for National Council of Education for the Study of Pharmacology. He worked at University of Calcutta, Dept of Botany as Assistant Professor in 1918 and left in 1922 to join as Director in Industrial Section of Museum.

He was director of Pharmacognosy, Govt. of India and from 1948 he worked as advisor in Pharmacognosy in Bengal immunity company. He worked there for 25 years. He has been responsible for initiating Mycological Researches and Pharmacognostic Study in the State of West Bengal and published several papers.

Prof. Balaichand Kundu (1900-1989)

Prof. Balaichand Kundu was born on April 18, 1900 and did his Ph.D. on 1939 at University of Leeds. His was specialized in Anatomy, Jute Technology, Plant breeding, and introduced three high yielding jute varieties. He was Professor in Botany at Presidency College, Calcutta and Director of Jute Agricultural Res. Inst. (1946-60) and also performed as Joint Director of Bose Institute. He acted as Hon. Lecturer in Dept. of Botany, University of Calcutta.

He worked extensively on Jute, Mesta and Taxonomy of the family Minispermaceae. He worked on Algal division Charophyta as well and considered to be an expert in Algology also. He was president of Bot. Sec., Indian Sc. Congress in 1954, President Botanical Soc. Bengal, and recipient of 'Rafi Ahmed Kidwai prize' in 1974, elected as Fellow and Council Member of INSA. He Died on 22nd January, 1989.

Prof. H.C. Ganguly (1914-1992)

Prof. H.C. Ganguly, born on June 28, 1914 at Faridpur, died Oct. 7, 1992.He did his D.Sc. at University of Calcutta in the year 1955 on genetics of rice and became FNA in 1979. He recorded that Aman rice is a photoperiodic variety of indica rice. He later extensively dealt with the Taxonomy of Indian mosses and published voluminous Treatise on Indian Mosses. He served as Professor and Head, Dept of Botany, Darjeeling Govt. College (1962-63). Professor of Presidency College 1963-1972 and later became Professor of Botany, University of Calcutta. His monographs on 'Mosses of Eastern India and adjacent regions (1980)' are considered as the classics in this field. Dr. Ganguly was member of the Biological Society of many countries.

Prof. Param Nath Bhaduri

Prof. Param Nath Bhaduri born on August 21, 1908. Did his M.Sc. on 1931 from Calcutta, Ph.D from London and D.Sc. from University of Burdwan. His specialization was on Plant Cytogenetics and became FNA in 1944.

He availed the Palit Traveling Fellowship of the University of Calcutta to go to London and worked with Prof. R. Ruggles Gates to obtain his Ph.D. degree with strong recommendation. He developed new technique for study chromosome nucleolus relationship with Feulgen Light Green Method. He worked extensively on cytogenetics of *Tradescatntia, Scilla* as well as other genera. He was awarded 'P.J. Bruhl memorial award' of the Asiatic Society, Fellowship of the Royal Horticulture Society, London, Linean Society of London and Royal Microscopical Society of London. He was the member of ISCA council.

Prof. Bhaduri was Lecturer in Botany, University of Calcutta (1935-1946), Cytogeneticists IARI, New Delhi (1948-1956), Senior Prof. of Botany and later Vice Chancellor, University of Burdwan (1965-1973), Scientist-emeritus of ICAR (1973-1978).

Prof. Provat Chandra Sarbadhikari

Prof. Provat Chandra Sarbadhikari, D.Sc. (London), Ph.D. (London, DIC, FLS), was 'Rashbehary Ghosh Professor of Botany' (1946-1953).

Prof. Sarbadhikari succeeded Prof. S.P. Agharkar as Sir Rashbehary Ghosh Professor of Botany, University College of Science, Calcutta. He was a former student of Late Sir J.B. Farmer at the Imperial College of Science and Technology, London. He obtained D.Sc. degree from University of London and obtained distinction in research. His contributions principally covered cytological work with important contributions to the Life history of Fungi, Pteridophytes and Angiosperms. In Pteridophytes his work on apogamy and apospory in *Osmunda and Doodea* earned him international acclaim. He retired from the service in 1953. Earlier, before joining the University he was in colonial service at Colombo and worked at Jodrell Laboratory at the Royal Botanic Garden, Kew, John Innes Horticultural Institution, U.K., with Prof. Bateson as well as in Paris with Prof. Guillermond. He was Professor of Botany at the University of Ceylon before joining the University of Calcutta.

Prof. Girijaprasanna Mazumder

Professor Girijaprasanna Mazumber was born on February 18, 1894 and died on November 21, 1959.

He did his B.Sc. on 1913, M.Sc. on 1915; B.A. on 1916; B.L.on 1917 all from University of Calcutta. He did his Ph.D. from University of Leeds in 1940.His Specialization was in plant Anatomy and History of Botany. He received the Griffith's prize in 1925 and became Fellow of Indian National Science Academy in 1943.

He started his career at the Department of Botany, Presidency College, Calcutta. He worked as demonstrator (1913-1915), Lecturer (1915-1928) and finally as Professor (1940-1949). He worked as Professor at University of Calcutta (1928-1940); Honorary Professor of Department of Botany, Darjeeling Government College (1949-1951) and Professor and Head, in Department of Botany, University of Dacca (1951).

Prof. Mazumder carried research on Anatomy, specially on apical organization of plant organ, X-ray drefraction study on collenchyma cells. Because of his knowledge he became an authority of ancient Sanskrit literature in history and development of Botany in ancient India. Of the different books written by him mention must be made on *Vanaspati, Botany in Ancient India, Some Aspects of Indian Civilizationin Plant Perspective*. One such most important contribution was editing and translating of "*Upavana Vinoda*" and a very ancient arbori-horticultural text. Another Sanskrit text on agriculture, entitled *Krishi Parasara*, published by The Asiatic Society, was also edited by him. He was Fellow of the IndianAcademy of Sciences, Bangalore; Vice President of Indian National Science Academy, Delhi; and President of Indian Botanical Society; Pakistan Academy of Sciences; President, Botany section, Indian Science Congress (1955).

Prof. Ilabanto Banerjee

Ilabanto Banerjee was born on 27th May 1898 at Calcutta. He was educated at the University of Calcutta–B.Sc. (Hons) on 1920, M.Sc. on 1922 and D.Sc. on 1945. He was an IARI Research student in 1922; Coimbatore Agricultural Research Institute 1923-1926; Central College at Bangalore–Senior Research Scholar 1926; Institute of Plant Industry at Indore–Senior Research Scholar 1926-1928. At the Department of Botany, University of Calcutta he was Ghosh Research Scholar in 1928; Lecturer in Botany 1929-1956; Reader and Head, Department of Botany 1956-1960. He was elected as fellow of INSA in 1945.

His main contributions are in the field of Cytology, embryology and several Indian Plant families including crop plants such as cotton and jute. He was the first scientist to work on the Chromosome number of cotton by aceto-carmine technique. He and his students worked out on the embryology and mode of development of floral organs as well as Embryo and Endosperm. Even among the mosses he worked on *Barbulaindica* morphology and anatomy, cytogenetics of fern like Polypodiaceae and Parkeriacae, in addition he worked on the flora of Manipur as well as grasses of 24 Parganas. He also studied on the reproductive biology of *Eichorniagrassipes* and *Carica papaya*. In fact his school of Embryology, from which a large number of students came up were also next to that of P. Maheswari at Delhi. He was Fellow and President of Indian Botanical Society, 1960; Fellow of the Linnaean Society as well as Indian Academy of Sciences, Bangalore. He was also the President of Botanical Society of Bengal for 1955-1957.He died on January 31, 1971.

Prof. P.N. Nandi

Prof. Paramnath Nandi was born in 1911 did his M.Sc from Calcutta and Ph. D. and DIC from London. He served as Head, Department of Microbiology Bose Institute and also as Part Time Faculty Member of Department of Botany, CU and established the Microbiology Laboratory.

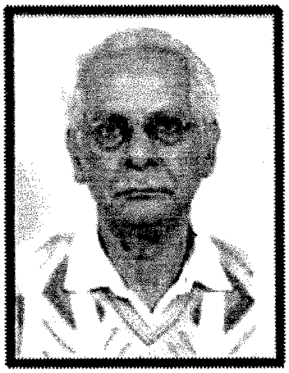
In 1942 when the Department of Microbiology was established by the then Director of Bose Institute, the research on antibiotics was in its infancy and bacteriology was confined mostly to taxonomy and on pathogenic bacteria. At that time Dr. P. N. Nandi joined the group led by Dr. H.K. Baruah, who later became Head, Dept. of Botany, Cotton College, Assam.

Investigations on antibiotic producing soil microorganisms were commenced in 1943 by Dr. Baruah and Dr. N.C. Dey and Dr. P.N. Nandi. The initial success with penicillin producing microorganisms encouraged large scale soil plantings in the Department to isolate more potent broad spectrum antibiotic yielding microbes. This project met with considerable success. Dr. P.N. Nandi took charge of the department in 1949 and continued till 1974.

Dr. Nandi was an active member of the Indian Mycological Society. He demonstrated inhibition of *Rhizobium* and *Azotobacter* by soil fungi, Actinomycetes and using purified antibiotic substances isolated from these organisms.

Dr. P.N. Nandi and his associates including Dr. Arati Roy chowdhury, started research in the year 1962. Mass scale production of *Rhizobium*, for legume seed inoculation, was continued for several years under ICAR projects. Bacterial manure made upof *Rhizobium* and *Azotobactercultures* were supplied to State Departments of Agriculture of Uttar Pradesh, Madhya Pradesh, Andhra Pradesh, Orissa and West Bengal and to individual farmers and cultivators leading to about 40% increase in crop yield. Considerable work has also been done on *Rhizobium* genetics using drug resistant and biochemical mutants. A survey of air microflora was undertaken and a correlation between periodic variation of fungal spore and the incidence of human allergy in various seasons under changing climatic factors was established. He publishedabout 90 publication in National and International Journals and about 20 students have obtained their Ph. D. (Sc.) degree under his supervision.

Prof. Sunirmal Chanda



Born in 1932, completed M.Sc. (Botany) from Calcutta University, and Doctorate (Environmental Science) from University Goetingen, Germany. His areas of research are Palynology, Aerobiology, Paleobotany, Pollen chemistry, Immuno-bilogy, Plant Echology & Biodiversity.

Received National & International assignments at various times from: German academic exchange program (DAAD), Bonn–Germany; UNESCO, Paris–France, Stockholm–Sweden; Norwegian Science Research Council, Oslo–Norway; The British Council, London–U.K; French Academy of Sciences, Soviet Academy of Sciences, National Science Foundation, Washington DC, USA, Overseas Development Administration, London,German Association for Technical Co-operation, GTZ, GermanSociety for Advanced Research Deutsch Forchungs—Gemeinchaft, Japanese Science Foundation, and others. He has received numerous National grants fromvarious Government agencies and attended many Indian and International scientific conferencesall over the world at various times.

Honored with Distinguished Fellowships from: Indian College of Allergy and Applied immunology, Delhi; The Palaeobotanical Society, Lucknow; Palynological Society of India, Lucknow; Indian Aerobiological Society, Calcutta, West Bengal Academy of Science andTechnology, Calcutta.

Research works performed in India and Abroad at various times are: with Dr. J. Sen, University of Calcutta; with Prof. F. Firbas, University of Goettingen, Germany; with Prof. G Erdtman, Palynological Laboratory, Swedish Museum of Natural History, Stockholm, Sweden; with Prof. K. Faegri, University of Bergen, Norway; with Dr. Joes Iversen, Geological Survey of Denmark, Copenhagen, Denmark; Bose Institute, Calcutta, India; University of Bordeaux, France; Rothamsted Experimental Staiton, Harpenden, Herts, U.K; Wayne State University, Detroit, USA; North VCarolina Central University, Durham, USA; Lndesanstaltfuer Bienenekunde, University of Hohenheim, Germany and others.

Distinctions obtained among others : Member of the Executive Council of International Federation of Palynological Societies, Member of the Executive Council of INQUA, Birmingham, Genaral President of International Association for Aerobiology, Founder President, Indian Aerobiological Society, Reciepient of Prof. Gunnar Erdtman International Gold Medal, President, Indo-German Association, Calcutta, Chairman, Internationjal Commission on Aerobiology, President, National Botanical Society, Calcutta, Recipient of first Dr. D.N Shivpuri Memorial Oration and Award instituted by Indian college of Allergy and Applied Immunology, President, Indian College of Allergy and Applied Immunology, Adviser to the Ministry of Health, Govt. of Kuwait, on the matters of Environmental Biopollution, Recipient of Prof. A.K.Ghosh Memorial Oration award and others.

Publications: More than 350 research papers published and edited eight reference books onvarious disciplines. A special "Prof. Sùnirmal Chanda 60th birth Anniversary Felicitation Volume "entitled" Current concepts in Pollen-Spore and Biopollution Research", edited by N.M. Dutta, S. Gupta Bhattacharya, S. Mandal and K. Bhattacharya was published in 1998 by Research Periodicals and Book Publishing House, Houston, USA. Currently serving the Allergy and Asthma Research Centre, Purnadas Road, Kolkata, as its President.

He died on 18th January, 2015.

Botany Teaching and Research–Historical Perspective

ALGOLOGY

Teaching and research in Algology of Botany Department was initiated by Dr. Kalipada Biswas at post graduate level of CU since 1940–who was acting as the superintendent of Royal Botanic Garden, Calcutta. Being very much interested in this subject, he used to take regular classes for M.Sc students of this Department and Prof. A.K. Sharma was one of his students. Dr. Biswas' immense interest was in Algal diversity study and he worked as a pioneer Phycologist of West Bengal. He also worked as an Emeritus Scientist of CSIR in this Department. As a naturalist, he was of the opinion that more than 75% of marine and freshwater algae are unknown and therefore he made a rich and extensive collection of many rare plants including algae from India and the neighboring countries, like, Nagaland, Tripura, Manipur, Orissa, Bihar, Sikkim and South Burma. His collections are maintained at the Central National Herbarium and also in Calcutta University Herbarium (CUH).

Dr. Biswas made an extensive study on algal association of mangrove region of Indian Sunderbans and reported 12 cyanobacteria, 2 green and 3 red algae from mangrove bed and mud flat diatom, which are till date considered as the oldest record of algal flora of this area. Algal vegetation of south east coast and their habitat was compared with that of west coast of India by him and he also commented on Algal distribution of Indian Ocean, the North Atlantic Ocean together with Malayan and Australian Coast. He had nearly 40 publications, among which, 'Algal flora of Chilika Lake (1932)', 'Census of Indian Algae (1932)' and 'Common Diatoms of Loktak Lake (1937)' are few to mention. He also published 2 volumes of the book 'Common freshwater and Brakish water algal flora of India and Burma.

Afterwords, Dr. Probir Chatterjee joined as a teacher of Phycology in the year 1971 and established the Phycology Laboratory. He became world famous for his monumental works on the cytology and cytotaxonomy of Characeae with his research group. However, his active full-time research started much earlier when he joined the research team of Prof. A.K. Sharma in the Department of Botany, Calcutta University. He standardized excellent chromosomal preparations of characeae especially from synchronized mitotic divisions of antheridial filaments and made the observations, essential for cytotaxonomic studies. He established green algal cultures including those of charophytes (members of the order Charales) for cytotaxonomic investigations. This was the first cytotaxonomic work on the charophyte flora of West Bengal. Later on research activities developed in different field of algology

The main lines of his research were—(i) Cytology and cytotaxonomy of various species and interspecific taxa of Characeae from new locations of West Bengal, (ii) Nucleolar staining in vegetative cell in *Chara sp.,* (iii) Germination of *Chara* oospore and development of new axis under axenic condition, (iv) Scanning electron microscopic study of oospore wall ornamentation of various species of *Chara* and *Nitella,* (v) Measuring the nuclear DNA by cytophotometry, (vi) Effect of chemicals on chromosome of *Chara* and *Nitella*, (vii) Effect of γ-ray, x-ray on chromosome and morphology, (viii) Mass cultivation of *Spirulina* (ix) Ecological studies on phytoplankton, (x) Morphological and cytological studies on mosses. All these works resulted in excellent publications in peer reviewed journals of international standard and Ph. D. degrees for research scholars. The major outcomes were—(i) Methodology to work out ideal metaphase plates in antheridial filament cells and cells of vegetative shoot apices was perfected with new pretreatment schedule and this led to karyogram construction and TF% calculation, (ii) Several new species and interspecific taxa of *Chara* and *Nitella,* collected from various districts of West Bengal, were worked out cytologically, (iii) New polyploid species were identified with improved cytological technique, (iv) New ploidy level, excellent chromosome morphology, Karyogram construction and TF% calculation led to new taxonomic concepts in charophytes and helped locating primary centers of origin, (v) Methodology was standardized to germinate oospore in axenic condition and *Chara* axis was differentiated within the culture medium. This would eventually help in conservation and introduction of new *Chara* species in new natural habitats, (vi) Scanning electron microscopic study of oospore wall ornamentation was conducted and a few taxonomically significant features were revealed, (vii) A breakthrough in cytological work was achieved when DNA content of antheridial filament cells and vegetative cells were measured through cytophotometry. Earlier, this methodology was restricted to angiosperms. Feulgen staining in charophytes was standardized for the first time and then the stained material was subjected to cytophotometry. The amount of DNA measured helped to determine whether there were endoreduplication and the variation of DNA amount during origin and evolution of new species, (viii) Studies on theeffects of various chemicals and ã-ray, x-ray on chromosome behavior yielded excellent results. The effects were not only on chromosome but also on taxonomically significant morphological features. The results indicated that variation of morphological features, as found under natural conditions, should not always be considered for taxonomic identification, (ix) A new medium with supplementation of cheap organic source was formulated for growing *Spirulina* as food supplement for poultry and livestock, (x) Natural occurrence of phytoplankton and their relation with physico-chemical properties of water were studied as they are important for environmental monitoring of aquatic bodies, (xi) Significant contributions were made with regard to moss taxonomy. Study of exine ornamentation in mosses established their taxonomic significance. This work was conducted for the first time with Indian population of mosses.

During this period (1981 to 1991), twenty research publications were published in peer reviewed journals and four research scholars were awarded Ph.D. degree. New special paper Phycology was introduced in M.Sc. course. Dr. Chatterjee died on 1991.

In the year 2000, Dr. R. Pal joined and continuing as teacher in charge in Phycology section and re-established the Phycology Laboratory of CU.

Ph.D. Students

Dr. Anutandra Mukhopadhyay, Dr. Samit Ray
Dr. Ruma Pal, Dr. Madhu Agrawal

EMINENT TEACHER IN ALGOLOGY

Dr. Probir Chatterjee (1937-1991)

Dr. Probir Chatterjee graduated from Presidency College, Calcutta, in 1958 and did his M.Sc. from University of Calcutta in 1960. He started his career as Lecturer in Botany, Presidency College (1961-1969) and joined as a Research Fellow under the guidance of Prof. A.K. Sharma and obtained Ph.D. degree in the year 1971. Later he joined Darjeeling Govt. College (1971-1973), later resigned from Govt. service and joined as Lecturer in the Centre of Advanced Studies for Cell and Chromosome Research in the Dept. of Botany, CU (1973-1991). He was a very popular and dedicated teacher. His depth in knowledge in all branches of Botany attracted students.

In CU, he established the Phycology Laboratory in new form. His contribution in the field of Cytotaxonomy of Algae, especially Charophytes was monumental and widely recognized. His dedicated involvement during the last two decades led to the establishment of an active group of workers in the field of Phycology. He visited Queen Mary College, London. He was one of the founder members of the Phycological society of India. Four scholars received Ph. D. under his guidance. He had 46 research publications to his credit until 1989.

MYCOLOGY AND PLANT PATHOLOGY

Dr. S.N. Banerjee established the Mycology and Plant Pathology Laboratory in the Department of Botany, University of Calcutta in 1939 when he joined in the department as an Assistant Lecturer. Dr. Banerjee developed Mycology and Plant Pathology Laboratory with the little resources available at the time under the able guidance of his mentor, philosopher and guide, Prof. Sahay Ram Bose. Prof. Bose rendered all sorts of help and co-operations to Dr. Banerjee in teaching and research during this period.

During the period of 1949–1951, when Dr. Banerjee was in Edinburgh, U.K., for his Ph. D. programme, late Dr. P.N. Nandi of Bose Institute and late Dr. A.K. Ganguli of City College took active role in running Mycology and Plant Pathology laboratory in a befitting manner.

In due course Dr. N Samajpati joined this laboratory as Lecturer in Botany in 1968 and late Dr. R.P. Purkayastha joined this laboratory as Lecturer in Botany in 1969.

Dr. S.N. Banerjee retired from the University in 1974. During the period of 1974–1975, Late Prof. A.K. Kar of Presidency College and late Prof. S.B. Chattopadhyay of Bidhan Chandra Krishi Biswavidyalay made very useful and constructive contributions for the development of the Mycology and Plant Pathology laboratory.

Both late Prof. R.P. Purkayastha and Prof. N. Samajpati contributed significantly in their respective fields of research and teaching to make this Mycology and Plant Pathology laboratory to be recognized as one of the best in India and abroad.

After the retirement of late Prof. R.P. Purkayastha, Dr. K. Acharya joined this laboratory as Assistant Professor in 2004. Later on after the retirement of Prof. N. Samajpati, Dr. Surekha Kundujoined this laboratory as Assistant Professor in 2006.

Since then both Dr. Acharya and Dr. Kundu are contributing effectively in their respective fields of research and teaching to maintain the status of the Mycology and Plant Pathology laboratory and also trying their best to uplift further the status of this laboratory through their innovative activities.

Achievements

All the faculty members of this laboratory have made significant achievements in their fields of research and are still continuing to do so.

Some of these achievements are mentioned hereunder.

Since the inception of this Mycology and Plant Pathology laboratory, researches on the taxonomic study of polypores and agarics was started by late Prof. S.R. Bose. He also discovered two new antibiotics, namely polyporin and campestrin from higher fungi and initiated the study of Medical Mycology in the school of Tropical Medicine for the first time in West Bengal.

Late Dr. S.N. Banerjee initiated the study of tree and timber pathology and identified about 139 species of Agarics from West-Bengal. He also contributed immensely on the study of cytology, physiology and genetics of higher fungi. His monographic works on Thelephoraceae of Bengal also earned him national and international recognition.

Late Dr. S.B. Chattopadhyay made extensive study on almost all the common crop disease of West-Bengal and recommended their control measures which are still meticulously followed by the Department of Agriculture, Government of West-Bengal.

Late Prof. A.K. Kar initiated the study on Myxomycetes and on higher fungi like Hyphomycetes, Coclomycetes, Pyrenomycetes and Teliomycetes and other for the first time in West Bengal.

Late Prof R.P. Purkayastha developed his research activities in the area of physiological and molecular plant pathology with special emphasis on phytoalexins and induced resistance in plants. He initiated the work on the application of immunoserelogical techniques for determining the basic compatibity factor between host and fungal pathogens. He also developed the cultivation technology of *Calocybeindica* P&C.

Prof. N. Samajpati continuing the research works on tree and timber pathology initiated by late Dr. S.N. Banerjee also studied the biochemical and molecular nature of disease resistance in heart wood of *Shorearobusta* G.f. and identified the compound responsible for resistance and coined it as *Robustinol.* He initiated the study on the taxonomy, physiology, biochemical and medicinal aspects of the agarics of West Bengal specially of the local edible species. He developed the cultivation technology of *Agaricusbitorquis, Pleurotussajor-caju*and other species of *Pleurotus, Lentinussquarrosulus, Macrocybe (Tricholoma) gigantium, Tricholomacrassum* and *Tricholomalobayense* under the rural climatic condition West-Bengal. He studied extensively the etiology in collaboration with Prof K.R. Samadder, University of Kalyani and recommended the control measures for Hooghly Wilt of Jute and Tomato wilt of Coochbehar. He also studied extensively the diseases of betelvine and recommended the control measures. He also initialled the study on Ectomycorhizal fungi of Sal forest and VAM fungi of the agricultural fields of West-Bengal. He introduced for the first time the cultivation of legume as second crop in the monocrop saline belt of south 24-parganas by dual inoculation of saline resistant strains of *Rhizobium* and *Glomus* spp.

Presently Dr. K. Acharya developed the research activities on taxonomy, molecular phylogeny, ecological modeling and diversity of Macromycetes; on Nitric oxide as signalling molecule in SAR and ISR; on exploration of fungi in drug development, dietary supplements and on myconanotechnology.

Dr. Surekha Kundu is developing lines of research on RNAi mediated approach to develop necrotroph resistant crop lines, on gene regulation in response to stress in rice and tomato, on transgenic crop lines of rice, tomato sesame, tobacco, mustard and chilli, on improvement of mushrooms through transgenic approach and on identification of antimicrobial agents from fungi including mushrooms.

Ph. D. Students

More than 135 candidates obtained their Ph. D. (Sc.) degree of the University of Calcutta under the guidance of different Faculty Members of this laboratory. Names of some of them are mentioned below:

1. Dr. Anjali Roy
2. Dr. Balen Nandi
3. Dr. Ajit K. Ganguly
4. Dr. Dipak Gupta
5. Dr. N. Samajpati
6. Dr. Madhu Jyotsna
7. Dr. Pranati Ghosh
8. Dr. Sajal K. Chakraborty
9. Dr. Samar K. Ghosh
10. Dr. Asok K. Das
11. Dr. Kanak Ranjan Sarbanga
12. Dr. Krishnendu Dutta
13. Dr. Tapan K. Dey
14. Dr. JaladBaranRoy
15. Dr. Nabajiban Bhattacharyya
16. Dr. Monoranja Mondal
17. Dr. Pradyut Nayak
18. Dr. Milan Maiti
19. Dr. Binoy K. Das
20. Dr. Himagshu Chakraborti
21. Dr. Aindrila Chandra
22. Dr. Chandi Roy
23. Dr. Firoj M llik
24. Dr. Ashish K. Choudhuri
25. Dr. Madhuchhanda Chattopadhyay
26. Dr. Ratna Banerjee
27. Dr. Dipak Nayak
28. Dr. Pradyot Kanti Ghosh
29. Dr. Nibha Thakur
30. Dr. Malay Chakraborty
31. Dr. Chhanda Raha
32. Dr. Biswanath Chakroborty
33. Dr. Usha Menon
34. Dr. Saswati Roy Choudhury
35. Dr. Bhaswati Bhattacharyya
36. Dr. Anima Ghoshal
37. Dr. Subrata Biswas
38. Dr. Tapati Mondal
39. Dr. Shampa Mitra
40. Dr. Ratna Chattopadhayay
41. Dr. Sumita Ghosh
42. Dr. Asok Kumar Das
43. Dr. Kamal Kumar Jana
44. Dr. Alokbaran Pattanayak
45. Dr. Arup K. Mitra
46. Dr. Asis K. Pal
47. Dr. Sushovan Bera
48. Dr. Rajyasri Ghosh
49. Dr. Isani Chaudhury
50. Dr. P. Samajpati
51. Dr. B. K. Chatterjee
52. Dr. Asish Ghosal
53. Dr. Snigdha Maitra
54. Dr. K. Chakraborty
55. Dr. M. Nagchaudhuri
56. Dr. Salil Basak
57. Dr. K. K. Mazumder
58. Dr. D. K. De
59. Dr. Animesh Roy
60. Dr. Suniti Ray
61. Dr. Mili Chakraborty
62. Dr. Chapalakanta Sur
63. Dr. Amlan Aich
64. Dr. Lalitha Rao

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65. Dr. Milan Bhattacharya
66. Dr. Satyakinkar Bera
67. Dr. Santibhusan Saha
68. Dr. Mitra Basu
69. Dr. Giti Roy
70. Dr. Priyabrata Basak
71. Dr. Mukti Bhattacharyya
72. Dr. Arunava Biswas
73. Dr. Achntya K. De
74. Dr. Panchanan Maji
75. Dr. Md. Shajahan
76. Dr. Anil K. Manna
77. Dr. Ajoy K. Saha
78. Dr. Swapan K. Roy
79. Dr. Bichitra K. Borthakur
80. Dr. Bulu Rani Basu
81. Dr. Tapan K. Maitra
82. Dr. Anathbandhu Das
83. Dr. Pankaj Basu
84. Dr. Falguni Bhattacharyya
85. Dr. Bijan Bhowmick
86. Dr. Niranjan Raychaudhuri
87. Dr. Maitreyee Banerjee
88. Dr. Chhanda Bhattacharyya
89. Dr. Mausumi Roy
90. Dr. Bhudev Mazumdar
91. Dr. Sharmistha Kar Purkayastha
92. Dr. Anuradha Banerjee
93. Dr. Aditi Mukherjee
94. Dr. Ratula Mukhopadhyay
95. Dr. Nicky Singh
96. Dr. Nityananda Ghosh
97. Dr. B. K. Borthakur

EMINENT TEACHER IN MYCOLOGY AND PLANT PATHOLOGY

Prof. Sahay Ram Bose
(1888–1970)

Designation :

Hony. Professor, Department of Botany, University of Calcutta Professor of Botany, R.G. Kar Medical College, Calcutta Hony. Professor of Botany, Bangabasi College, Calcutta

Academic qualification :

M.A. in Botany, University of Calcutta, 1908
B.L. Examination, C.U. 1910
D. Lilt in Botany, University of Calcutta 1922

Academic Experience :

Lecturer in Botany, Bangabasi College, 1909
Professor of Botany, R.G. Kar Medical College, 1916-1970
Professor of Microbiology, School of Tropical Medicine, Calcutta, 1960

Recognitions :

Obtained Woodhouse Memorial Prize of the Bihar Agricultural Department, 1926.

Awarded Bruhl Memorial Medal and Barclay Memorial Medal of the Asiatic Society in 1947 and 1953 respectively.

President, Botanical Society of India for 1937 and 1938.

Fellow of the Royal Society of Edinburgh in 1925

Honorary Member of SocieteInternationale di Microbiologia of Italy 1930.

Fellow of the National Institute of Science of India in 1935.

Founder President of the Indian Mycological Society in 1954.

Director of Research in C.N.R.S., France, 1957-1959.

Fellow of the Indian Phytopathological Society, New Delhi.

Research activities :

He studied taxonomy, cytology, genetics and physiology of the member of Polyporaceae of Bengal.

He also initiated the study on Agaricaceae with special reference to their edible nature.

He initiated the study of medical mycology in the School of Tropical Medicine, Calcutta.

He prepared an international recognized herbarium of the Indian Polypores.

He initiated the study on antibiotics from higher fungi in India

Publications :

He has published about 120 papers in journals of International repute.

Dr. Prafulla Nath Ghatak, M.Sc., Ph.D. (1902-1939)

Dr. P.N. Ghatak was born in 1902 in Hashail village of Dacca. He graduated with Honours from Presidency College, Calcutta in 1925 and obtained his M.Sc. degree in 1927. In the same year he joined Presidency college as a lecturer in Botany. He went to England in 1929 to work under Prof. V.H. Blackman of the Imperial College, London and obtained his Ph. D. degree in normal course. After a continental tour he returned to India and was appointed in 1933 as an Honorary Lecturer in Botany of Calcutta University which he soon left to take up an appointment in Rust Research Scheme under Late Prof. K.C. Mehta. In 1935, he was appointed a Lecturer in the Botany Department of this University.

During his tenure of service in this University, he carried out original investigations on Phyto-pathological problems and attracted a band of workers some of whom have distinguished themselves as eminent botanists.

He died in 1939 at the early age of 37.

Dr. Sachindranath Banerjee (1905-1977)

Designation :

Reader and Head, Department of Botany, University of Calcutta

Academic Qualification :

M.Sc. in Botany, University of Calcutta, 1929

Ph.D. in Plant Pathology Edinburgh University, 1951

Academic Experiences :

Lecturer in Botany, City College, 1934-35

Lecturer in Botany, Surendranath College 1935-1939

Joined the Department of Botany, University of Calcutta as Assistant Lecturer in 1939; became Reader and Head of the Department of Botany, 1967 and retired from University service in 1970.

Honorary Research Professor of Mycology in the R.G. Kar Medical College, Calcutta

Honorary Research Professor, Agricultural Botany, Faculty of Agriculture, Univ. of Calcutta

Recognition : Received Sir RashbehariGhosh Research Scholarship and joined the Department of Botany, University of Calcuttaunder Prof. S.P. Agharkar.

Founder member of the Botanical Society of Bengal and became its Honorary Secretary, 1939-1941.

Founder member, Vice-President and Editor of the Indian Mycological Society and later became President of the Society.

He established for the first time the Mycology and Plant Pathology Laboratory in the Department of Botany, University of Calcutta and worked in close collaboration with his mentor, Prof. S.R. Bose.

Research activities : His critical monograph on Thelephoraceae of Bengal earn him national and international recognition.

He was the first person to study the agaries of Bengal and recorded and identified about 139 species from Bengal which established him as one of the leading Indian mushroom scientist.

He was the pioneer worker to develop the key for the identification of higher Hymenomycetous fungi on the basis of cultural characteristics;

He worked extensively on the taxonomic and physiological studies of higher Basidiomycetes;

He contributed immensly on the diseases of several important economic trees and on their control measures, namely, Elder, Norway Spruce, Oak, Teak and Sal.

He also contributed very much on the study of the diseases of felled Sal timber and its control.

Studied the cytology and physiology of several Hymenomycetous fungi.

Publications : He published about 76 papers in different reputed international and national journals.

Prof. Sudhanshu Bhusan Chattopadhyay (1923-2004)

Designation :

Prof. and Dean Faculty of Agiculture, Kalyani University, Kalyani,
First Vice Chancellor, Bidhan Chandra Krishi Visyavidyalaya, Mohanpur, Nadia

Academic Qualification :

M.Sc. in Botany, University of Calcutta, 1943
Ph.D. in Plant Pathology, University of London, 1948
DIC, Imperial College London, 1948

Academic experience :

Assistant Mycologist, Dept. of Agriculture, W.B., 1948
Mycologist, Dept. of Agriculture, 1953
Prof. and Dean, Faculty of Agriculture, Kalyani University, 1960
First Vice Chancellor Bidhan Chandra Krishi Visyavidyalaya, 1974
Advisor & Special Officer, Dept. of Agriculture, W.B.
Honorary Professor, Dept. of Botany, University of Calcutta

Research activities : Established a strong research team on Crop Pathology in the Mycology Section, Dept. of Agriculture, Govt. of West Bengal.Developed well equiped Departments of Plant Pathology, Genetics & Plant Breeding, Physiology, Agronomy in the BCKV, Nadia. Studied several common crop diseases of cereals, pulses, plantation crops and the control methods developed by his team were immediately transmitted to the farmers for successful implementation in the field.

Ph.D. Students : Altogether 26 candidates obtained their Ph.D. (Ag) degree in Plant Pathology from University of Kalyani and BCKV under his able guidance and supervision.

Publications : He published several books on plant protection, plant diseases both in English and Bengali version which are still highly acclaimed by the teachers and students. Published abort 150 research papers in reputed international and national journals.

Prof. Asok Kumar Kar (1924-2008)

Designation :

Professor & Head, Department of Botany, Presidency College, Kolkata,
Hony, Professor, Department of Botany, University of Calcutta, Kolkata

Academic Qualification :

M.Sc. in Botany, University of Calcutta, 1946
Ph.D. in Botany, University of Illinois, USA, 1961.

Academic experience :

Lecturer in Botany, Presidency College, 1953,
Professor of Botany, Darjeeling Govt. College, Darjeeling, 1967-1973
Professor of Botany, Presidency College, 1973-1986.
State Scholarship Holder, Universith of Illinois, USA, 1958-1961
Hony. Professor, Dept. of Botany, University of Calcutta.

Recognitions :

Fellow, Indian Phytopathological Society, New Delhi,
Honorary Member and Fellow, Indian Mycological Society
Member, Advisory Committee, Journal of Mycopathological Research, Kolkata,

Research activities : He was the pioneer worker who studied the distribution pattern and taxonomy of the members of Hyphomycetes, Coelomycetes, Pyrenomycetes and Teliomycetes of West Bengal.

He received the PL 480 research project of USA and completed the work most successfully and documented the unidentified fungal resources of Eastern India.

Ph.D. Students : About 17 candidates obtained their Ph.D (Sc.) degree from the University of Calcutta under his able guidance and supervission.

Publications : About 200 research articles have been published by him and his team in reputed international and national journals.

Prof. Rabindra Prasad Purkayastha (1935-2011)

Designation :

Sir Rashbehari Ghosh Professor of Botany, University of Calcutta
Professor & Head Department of Botany, University of Calcutta

Academic qualification :

M.Sc. in Botany, University of Calcutta, 1958.
Ph.D. University of London, 1965.
DIC Imperial College, 1965

Academic experience :

Lecturer in Botany, Viswa-Bharati University, 1968-1969
Lecturer in Botany, University of Calcutta, 1969-1977
Reader in Botany, University of Calcutta, 1977-1985
Professor of Botany, University of Calcutta, 1986-1992
Professor & Head in Botany, University of Calcutta, 1992-1994
Sir Rashbehari Ghosh Professor of Botany, University of Calcutta, 1995-2000

Recognitions :

- Fellow of Indian Phytopathological Society (FPSI), New Delhi (1976)
  British Council Visitor, UK (1978).
- Study Visitor-INSA Royal Society Exchange of Scientists Programme (1982).
- President, Indian Mycological Society (1987-88).
- President (Botany section) - 76th session of Indian Science Congress (1988-89).
- Foundation fellow, West Bengal Academy of Science and Technology (1989).
- Recipient of Asiatic Society Award (Paul Johannes Bruhl Memorial Medal for Asiatic Researches in Botany, 1991).
- Fellow of Indian National Science Academy (1993)
- Fellow of National Academy of Sciences, Allahabad (1995)
- Fellow, National Academy of Agricultural Sciences (1996)
- President, National Botanical Society of Bengal (1997-99)
- Professor S.N. Dasgupta Memorial Lecture Award, Indian Phytopathological Society, New Delhi (1997)
- President, Indian Botanical Society (1998)
- Platinum Jubilee Lecture Award, ISCA (2001)
- Eminent Teacher Award, University of Calcutta (2007)

Research activities :

Professor R.P. Purkayastha made significant contribution in the field of Mycology, Physiological and Molecular Plant Pathology and Phytoimmunology. He was well known for his research on phytoalexins, disease resistance and induced immunity in plants. His contribution to the field of phytoalexin research related to plant disease resistance is most significant. He conclusively demonstrated the involvement of phytoalexins in differential resistance of crop plants such as broad bean, soybean groundnut, jute and rice plants to their respective fungal diseases. Professor Purkayastha has done pioneering work on the application of immune-serological techniques to study the involvement of cross-reactive antigens as a basic compatibility factor in host parasite relationships. His novel work on the practical application of immune-serological technology for determining basic compatibility factor in legume hosts and their parasites was also noteworthy. He subsequently worked out the reliability and applicability of two biochemical parameters (viz. phytoalaexin and host-pathogen cross reactive antigens) for screening disease resistance germplasm*in vitro*. Prof. Purkayastha worked on disease management of crops (selected) through non conventional methods including induction of defence proteins/immunoproteins and molecular diagnosis of plant diseases. He successfully induced resistance in rice, jute, soybean, groundnut, ginger against various fungal diseases. He has also highlighted that different plant defence activators could trigger systemic resistance in plants by inducing different sets of defence related proteins depending on the nature of activator and identified potent defence activators for use in plant disease management. Significant contribution has also been made to the field of mushroom science. He has to his credit the development and introduction of cultivation technology of a new edible mushroom (*Calocybeindica* P&C). He first showed that intraspecific sterility in *Coprinus* could be exploited as a strategy for biocontrol of weed fungi in mushroom bed. His work on heavy metal uptake by edible mushrooms and food chain effect on mammalian system was also significant. Purkayastha's works on biological control of crop diseases, pesticidal effects on biochemical defence of crop plants against fungal diseases, fungal decay resistance of wood of several constructional timber species, survey of foliar fungi of mangrove ecosystem of Indian Sundarbans are also noteworthy.

Ph.D. Students : He guided 28 students to obtain their Ph.D. degree.

Publications : He authored/edited some books and has more than 200 research publication in Indian and foreign journals.

Prof. Nirmalendu Samajpati

Date of Birth : 31st January, 1939.

Academic Qualification : M.Sc., Ph.D. (Sc.)

Address : Professor and Head (Retd.), Department of Botany, University of Calcutta, Kolkata-700 019, West Bengal.

Position : Hon. Faculty Member, Department of Seed Science & Technology, Faculty of Agriculture, University of Calcutta, 35, B.C. Road, Kolkata-700 019.

Teaching Experience : About 47 years in Undergraduate and Post Graduate Course.

Research Experience :

i. Researches on Taxonomy, physiology, biochemistry, nutritive value, neutraceutical value, molecular biology and cultivation of edible mushrooms.
ii. Researches on ectomycorrhizal association of Sal trees in different forests of north-eastern India.
iii. Researches on endomycorrhizal association of crop plants in different agriculture fields of West Bengal.
iv. Researches on microbial retting of jute sticks.
v. Cultivation of legume crop in saline belts of Sunderbon, West Bengal through introduction of salt tolerant *Rhizobium* strains and *Glomus* strains.
vi. Studied diseases of betelvine and sugarcane occurring in West Bengal.

Research Schemes : Conducted several research projects funded, by Department Agriculture, Govt. of West Bengal, Indian council of Agricultural Research, New Delhi, Council of Scientific and Industrial research, New Delhi, Department of Science & Technology, New Delhi and Department of Biotechnology, New Delhi.

Publication :

- i. Published 155 scientific papers in different National and International journals.
- ii. Published several books.
- iii. Formulated for the first time the microbial consortium for retting of jute fibre which was patended under the Govt. of India Patent regulation.

Research Students : Until now 48 students have obtained their Ph.D.(Sc.) degree under his supervision. One student has obtained Ph.D.(Sc.) degree of Dibrugarh University under joint supervision.

Recognition and Honours :

- i. President, The Agricultural Society of India;
- ii. President, Indian Mycological Society;
- iii. President, Botanical Society of Bengal.

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PLANT TAXONOMY

Teaching Botany in our Department started by Plant Taxonomist, Mr. C.C. Calder, Superintendent of the then Royal Botanic Gardens, Sibpur, Howrah (Presently known as A.J.C. Bose Indian Botanic Garden) in the year 1913. His subject of interest was mainly Plant taxonomy. Sir Ashutosh Mukherji, the then Vice Chancellor of the University of Calcutta appointed Prof. S.P. Agharker as Ghosh Professor of Botany in May 1914 and deputed him to Germany to specialize in plant taxonomy under Prof. Engler. He studied under Engler, G. Haberlandt Diels, C. Correns and R. Pilger and obtained his Ph.D degree from the University of Berlin in December 1919 and his thesis was categorized as very laudable by both Prof. Haberlandt and Prof. Engler. After obtaining his Ph.D. degree he went around the herbaria of Norway, England Kew (London), France, Spain, Italy and conducted several tours to Pyrenees and Sierravada mountain in addition to the Mediterranean coast. He made extensive collection of herbarium specimens to be ultimately utilized for the herbarium of the University of Calcutta, where he was appointed as Ghosh Professor before his departure to Germany. Practically he started his work as Ghosh Professor in Calcutta University in July 1920 and since then taught Systematic Botany and Plant Geography in Calcutta University.

During the period, when Prof. S.P. Agharkar was abroad in Germany, the students of the post-graduate classes were looked after by Prof. Brühl who was given this duty in addition to charge of Research.

Dr. Kalipada Biswas–student of Prof. Bruhl obtained his D.Sc. degree in 1937 from the University of Edinburgh and became a renowned Plant taxonomist. He was the curator of the National Herbarium from 1927 and later became the first Indian superintendent of Royal Botanic Gardens, Sibpore following the retirement of C.C. Calder.

In later period many renowned taxonomists like, Prof. H.L.Chakraborty, and Prof. Prasanta Mukherjee enriched this division of Botany Department. Presently Prof Nanda Dulal Paria and Dr. Debabrata Maity are maintaining the legacy of this important division of Botany.

EMINENT TEACHERS AND PERSONALITIES

Prof. Hiralal Chakravarty (1904-1998)

Born in Dacca, Bangladesh, Prof. Chakravarty passed his M.Sc. examination from this department in 1930. After his initial stint at the School of Tropical Medicine at Calcutta under Dr. R.N. Chopra, Prof. Chakravarty joined the Department of Botany Presidency College, Calcutta in 1938 and served there till 1962. While at the Presidency College, Prof. Chakravarty used to teach taxonomy to the M.Sc. students of the department of Botany, Calcutta University as a Guest Lecturer.

Prof. Chakravarty obtained his Ph.D. degree from the Edinburgh

University under Dr. W.W. Smith for his thesis on the Indian Cucurbitaceae. He was also awarded M.A. (Cantab.) by the Dowining College, London. On his premature retirement from the Presidency College, he joined Government of Iraq as the foreign expert in economic botany under its ministry of Agriculture. Later, he was appointed as a UNESCO Professor at the Cape Coast University, Ghana, but after some years he returned back to Iraq to complete the task on economic plants there. On his return back to India, he served as an Emeritus Scientist at the Botanical Survey of India.

Prof. Chakravarty is considered as an authority on the Cucurbitaceae. His account of the family for India and Iraq are noteworthy. He presided over an international Symposium on the Cucurbitaceae at the Cornell University in 1980. His other contributions for the botany of Iraq include accounts on its plant wealth, medicinal plants and Solanaceae. Besides his many other publications on the cucurbits, he published an account of the Aconites of India and the Flora of the Cape Coast. He also studied the families like Ophioglossaceae, Passifloraceae, and Tiliaceae etc.

Prof. Chakravarty was a fellow of the Linnaean Society and a former President of the Botanical Society of Bengal. He instituted awards at the Indian Science Congress Association and the Botanical Society of Bengal for meritorious research in taxonomy.

Dr. Sushil Kumar Mukherjee (1909-1997)

Dr. Mukherjee, the then Curator and later Keeper of the Central National Herbarium, Sibpur was an honorary/guest lecturer in the department for a long time.

Born in a village in the district of Hooghly, West Bengal, he passed his M.Sc. in 1935 from the Calcutta University. He received his Ph.D. degree under Dr. William Wright Smith, at the Edinburgh University, for his work, "*Revision of the Labiatae of the Indian Empire*" in 1938. Dr. Mukherjee explored widely in India including Manipur (as an associate of Dr. Kingdon Ward), Chotanagpur, and North Bengal. His notable publications include "*A Botanical Tour of Chotanagpur*" (1947); "*A Synopsis of Indian and Burmese Polygala*" (1958); "*The Genus Brugiera in the Sundarbans*" (1960); "*The genus Alangium in India*" (1968); "*The Genus Brugiera in the Sundarbans*" (1960); "*The genus Alangium in India*" (1968); "*Orchids of the Plains of North Bengal*" (1975); "*Fern Flora of the Plains of North Bengal*" (1975) and etc. He started the publication on the enumeration of Indian flowering plants which formed the precursor of the revised "*Flora India*". Apart from his research activity, he took special care in infusing interest in taxonomy to the students while teaching at the university. He used to carry with him a specimen or two or fruits and etc, to demonstrate the characters of the family he was to teach on a day. Dr. Mukherjee guided fifteen students of this department for their Ph.D. degree. He inculcated amongst the students the interest in floristics and revisions. The revisions carried over under his guidance were the families like Caryophyllaceae, Annonaceae, Flacourtiaceae, and Umbelliferae. The floras, especially district ones, he guided included that of Dehra Dun, Howrah, Bankura, Hooghly, Jalapahar, Darjeeling, Murshidabad, Vishakapatnam, and Malda. Dr. Mukherjee published about 66 scientific papers and described 44 new species and varieties. He co-authored College Botany, Vol. 3 along with Prof. H.C. Gangulee and Dr. C.T. Dutta.

Under the care and guidance of Dr. Mukherjee important specimens of the CNH were transferred to the Lloyd Botanic Garden, Darjeeling for their safe keeping during the Second World War and taken back to the CNH after the war. He also took upon himself in arranging to segregate the mark the Wallichian and other type specimens in the herbarium. He took special care to guide students and researchers in handling the herbarium specimens properly. He had a compendium of knowledge about identification and was always ready to identify specimens for the students. Dr. Mukherjee was a fellow of the Linnaean Society, Indian Botanical Society, and Botanical Society of Bengal. The generic name *Eskeymukherjea* Sengupta & Mallick is named to honor him.

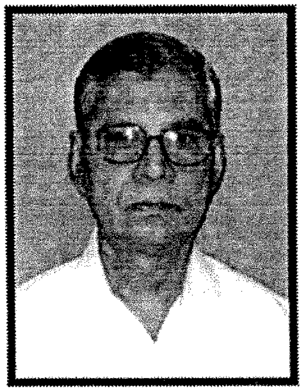
Dr. Nemai Chandra Majumdar (1931-2009)

Dr. Majumder served the department as the Keeper of the Herbarium before transferring his service to the Botanical Survey of India, where from he retired as the Deputy Director. He did his M.Sc. in 1953 and initially joined the Vidyasagar College as a Demonstrator in Botany and served there for about six years. Dr. Majumdar got associated with Prof. P.C. Datta and S.C. Datta for doing some taxonomic research, but ultimately he engaged himself to the study of Caryophyllaceae under Dr. S.K. Mukherjee for which he obtained his Ph.D. degree for the University. His works on Caryophyllaceae and Dilleniaceae were published in the Fascicles of Flora India. Besides publishing many new species in Caryophyllaceae, he collaborated with other taxonomists in publication of observations on flora, vegetation and etc. He was ever willing to help other taxonomists by providing Latin translation of diagnosis and/or description so necessary for valid publication of names, when the knowledge of that language is so scarce amongst people.

Mr. Jogen Chandra Banerjee

As a lecturer in Demonstrator cum Keeper of the Herbarium, he had interest in taxonomy and as a part of his teaching he used to guide the students in the field to get them familiarize with the plants in nature. He was interested in the study of the Myxophyceae.

Prof. Prasanta Kumar Mukherjee



Prof. Mukherjee, born in Mankar in the district of Burdwan, West Bengal, in 1943 and did his M.Sc. Burdwan University in 1964. He joined the Botanical Survey of India in 1965, where he was inducted as a member of the Joint Scientific Expedition to the Great Nicobar Island, organized by the Govt. of India in 1966. During his service there he got trained in field botany, herbarium practices and the taxonomic literature. He joined the Department in 1967 as the Keeper of the Herbarium. Subsequently, he was appointed as Lecturer in Botany, Burdwan University in 1974 and served there for little over 4 years. Prof. Mukherjee returned to the Calcutta University in 1979, where served as a Lecturer, Reader, Professor and finally as the Head of the Department of Botany and the Chairman of the Post Graduate Board of Studies in Botany. Prof. Mukherjee was appointed as an Emeritus Scientist at the BSI after his retirement from the University. As a teacher, he taught courses on taxonomy, including principles, history, classification, nomenclature, biosystemacitcs, and plant geography, both as a general as well as a special paper. The special paper 'Taxonomy of Angiosperms' was introduced in his time.

Prof. Mukherjee obtained his Ph.D. degree for the revision of Umbelliferae of Indian under the guidance of Dr. S.K. Mukherjee. Later he collaborated with some of the authorities on Umbelliferae, notably Prof. Lincoln Constance (Berkeley), Prof. V.H. Heywood (Reading), Prof. M.G. Pimenov (Moscow), and Dr. Ida Mandenova (Tbilisi). His expertise on the umbellifers is well recognized. His monograph "Umbelliferae (Apiaceae) of India" with Prof. Constance as the co-author was published by the Smithsonian Institution in 1993. As recognition to his researches on umbelliferae, he received an invitation by the Department of Botany, University of California, Berkeley, for visit and lecture; the INSA-USSR Academy of Sciences Exchange Award to visit institutions in USSR (1986); and grants from the British Council Division in India to visit labs in UK. Later, he conducted researches on the carpology and leaf architecture on some of the members of Umbelliferae including SEM studies through some of his students. He described five new genera of Umbelliferae, all endemic in India and effected several nomenclatural alterations.

Other areas, where Prof. Mukherjee extended his research were: *Floristics* (Great Nicobar Island; Singhbhum, and Keonjhar); *Revision* (Campanulaceae, Lobeliaceae, Piperaceae, and Ventilaginae of Rhamnaceae); *Remote Sensing* (Serpentine Vegetation, Andaman); *Geobotany* (Serpentines of Adnaman, and Phosphate mines, Singhbhum); *Climbers* (North Andaman, and Tropical forests of India); *Anatomy* (Climbers); *Micro morphology including SEM* (Campanulaceae, and Lobeliaceae); *Matching of sexes in dioecious plants* (*Piper* species); *Wetlands* (West Bengal); and *Ecology and reclamation of industrial wastelands* (Dhanbad). He guided successfully 16 students for their Ph.D. degree. He published 80 papers in peer reviewed national and international journals and chapters in edited books, apart from one book already mentioned. Prof. Mukherjee was called in to review papers for several journals, as also project proposals of the DST, MOE & F, UGC and CSIR.

Prof. Mukherjee visited the herbaria of Kew, British Museum, University of Reading, Geneva, Paris, Leningrad, Moscow University and Garden, Academy of Sciences, Tbilisi, Field Museum of Natural History, Chicago, Smithsonian Institution, Washington DC and the New York Botanic Garden, besides all the regional ones in India. He was also invited to deliver lectures at the CERC, Columbia University, and the Field Museum of Natural History, Chicago, USA. He served in various committees of the UGC, MOE & F, Institute of Environmental Studies & Wetland Management, West Bengal, West Bengal Biodiversity Board and some of the major universities in India.

Research : Engaged in research in Taxonomy since 1965.

Areas of Interest :

(a) Floristics : (Great Nicobar Island, Singhbhum dist., Bihar, Keonjhar dist., Orissa)
(b) Revision : (Umbelliferae, Piperaceae, Campanulaceae, Lobeliaceae)
(c) Micromorphology : (Umbelliferae, Campanulaceae, Lobeliaceae)
(d) Ethanobotany : (Purulia, Keonjhar dist.)
(e) Geobotany & Remote Sensing : (North Andaman Islands)
(f) Reclamation of Waste lands : (Dhanbad)
(g) Dioecy & Matching of sexes : (Piperaceae)
(h) Climbers & Lianas : (Biomorphology, Anatomy, Ecology)

PALAEOBOTANY AND PALYNOLOGY

Department of Botany, University of Calcutta is one of the pioneer and important centers for Palaeobotany–Palynology studies and researches in India. Palaeobotanical study in the department of Botany was introduced by Professor S.P. Agharkar. Professor A.K. Ghosh joined as Lecturer in the department in 1937 and continued as faculty member only for ten years (1937 to 1947). After his retirement from the Oil and Natural Gas Commission in 1963, Prof. Ghosh joined the department of Botany, again and continued teaching Palaeobotany-Palynology. He also guided research students, undertook research projects in the department and above all was involved in various National, International academic activities. He initiated the study of spores, pollen, all other microstructures derived from the plants of the geological past–the paleopalynology in India since 1937. Thus teaching and researches in Palaeobotany in the department of Botany, Calcutta University were carried out by Prof. Ghosh at a time when the subject was being studied only in India by Prof. Birbal Sahni, renowned scientist–teacher, who was Head of the Department of Botany and founder of the Birbal Sahni Institute of Palaeobotany, Lucknow.

Professor Ghosh's contributions drew attention of the scientists all over the world because of data recovered by him from the saline Series of the Punjab Salt range. Even though the record of land plants particularly the vascular plants in the Cambrian time is still an enigma, the contributions of Prof A.K. Ghosh on the discoveries of the tracheids, spores assignable to the vascular plants (Ghosh and Bose, 1952) from the Cambrian rocks have not been discarded yet, rather included in the high ranked text books of Palaeobotany by Stewart and Rothwell (1993) and Meyen (1987). Prof. Ghosh and his associates A. Bose, J. Sen investigated Cambrian rocks of Punjab Salt Range and Kashmir, a few Cambrian specimens from North America and other sites with older rocks from India. Their findings, however, were not in agreement with the view of the majority of investigators who did not consider occurrence of land plants, particularly vascular plants in the pre-Silurian time. They again published a paper on the spores of vascular plants obtained from nine samples of Cambrian rocks of North America, reiterating the existence of vascular plants in the Cambrian.

Prof. Ghosh, initiated various aspects of investigations on Palaeobotany and Palaeopalynology from Palaeozoic to Quaternary period, which became useful tool in resolving wide range of problems of basic and applied interest. Influenced by the works of Prof. Agharkar, Prof. Ghosh perceived the necessity to acquire thorough knowledge on the existing flora for a successful interpretation of the palaeobotanical finds. He studied the flora of Bengal, Bihar and Orissa and adopted the cuticular, palynological, anatomical studies of the extant plant for a precise comparison of the fossils. His work on the fossil pollen in the Tertiary rocks of Assam and on the submerged forest of Calcutta is noteworthy. The study of Calcutta Peat, was initiated by him. Record of *in situ* tree trunks identified as *Heritiera fomes* commonly known as Sundri trees during the excavation of the extension of the Dhakuria Lake in South Calcutta attracted interest of people of diverse professions. Study of Diatomaceous earth from Nicober Islands was significant. Prof. Ghosh along with Prof. Sen initiated coal palynology in 1945 and first isolated microflora from the coal samples of Raniganj coalfields; followed by a pioneer, important contribution on correlation of productive coal seams through microfossil study of the coal seams of Raniganj coalfield, Bengal, India, which was in its infancy at that period all over the globe.

After Prof. Ghosh left Calcutta University in 1948 his student Prof. Dr. Jitendra Kumar Sen joined the department as faculty member in 1947. Before joining as Lecturer in Botany, Prof. Sen worked as research scholar under Prof. A. K. Ghosh and from the very beginning of research and teaching, Dr. Sen contributed a number of pioneering research findings, the most significant ones were his discoveries on the *Glossopteris* fertile organs. Soon after, J. Sen in a series of publications described compression specimens of fructifications of *Glossopteris* from Indian Lower Gondwana which recovered after maceration cuticular structures similar to cuticles of ovule; in addition, Sori–like structures on *Glossopteris* leaf, and new type of male fructification referable to *Glossopteris* were described. A glossopteridean fructification similar to one of the fertile organs described from South Africa was recorded from India,. In a series of publications Prof Sen made unique contributions to reveal the internal structures of the ancient, fossilized woods including *Vertebraria* root of *Glossopteris*. Some important contributions were to record the organization of microscopic super-micelles in some carbonaceous materials in Indian coal and their woody mother substances, orientation of Quartz grains in some Indian silicified woods, structure of *Vertebraria* and X-Ray diffraction study of inorganic structural units in the fusinised fossil plant of *Vertebraria indica* and studied the fine structure in degraded ancient and buried wood and other fossilized plant derivatives .

Dr. Sen left India for higher studies in Europe during 1956-58, first in Stockholm, later in Glasgow, worked as research associate with Prof. O. H. Selling and Prof. John Walton respectively and made valuable publications. After returning from abroad he continued teaching and researches in the department of Botany. Research projects on the distribution of plant fossils in the Raniganj coalfield, the study of the Quaternary Peat deposit were undertaken. Seba Mukherjee and Manju Banerjee continued researches under Dr. Sen on Glossopteris flora.

Dr. Sen left the department in 1961 to join the West Bengal Government Service as the Superintendent of the Indian Botanic Garden at Sibpur.

Manju Banerjee and Seba Mukherjee made a rich collection of Glossopteridean fructications of the fertile organ *Scutum leslium* attached to *Glossopteris browniana* leaves, one of which is attached to the midrib of a complete leaf. The specimens were studied with the guidance of Prof Sen and an elaborate paper was published, isolating for the first time entire undoubted cuticles of ovules. Unfortunately, in the same year Dr Sen suddenly left us in December, 1966 to the heavenly abode. Within a short span of his life Dr Sen made innumerable significant contributions to enrich the knowledge on the plants of the past, their importance in academic and applied fields. Prof Ghosh and Prof. Sen also published a number of papers on living plants besides many articles of interest to the general students of Botany and also public.

Manju Banerjee initially started research under Dr. J. Sen and later continued under Prof A.K. Ghosh on Glossopteris flora between 1964 to 1971. The research findings were published in CSIR NEWS 1971 including photographs of the fertile organs. She dedicated her first paper on glossopteridean fructification in the name of Dr. Sen and named it as *Senotheca.* This is a pioneer contribution discovering for the first time a glossopteridean fertile organ in organic connection with a *Glossopteris* leaf recovering beautifully preserved 3-4 overlapping ovules with *in situ* bisaccate pollen in the well formed pollen chamber confirming the gymnospermous affinity of *Glossopteris*. Record of *Senotheca* has been published with illustrations in many books including the famous Text book of Meyen.The genus is now recorded from other Gondwana continents. The research interest of Professor Banerjee was on Lower Gondwana-Permian, particularly the study of the Glossopteris Flora which she is continuing till date. The research program assigned to her by late Prof. J. Sen to study the biostratigraphy of the Raniganj Formation (Upper Permian) of Raniganj coalfield was a huge task as the program included fossil data and sample collection from the shale layers of 14 coal horizons exposed in the coal seams of under ground pits and open quarry mines. Data and samples were collected from about forty collieries. These studies formed the basis for many other applied fields of studies viz., biostratigraphic zonations, correlation of the coal horizons of Raniganj Formation, within Raniganj coalfield and inter basinal correlation with the Mahuda basin, Jharia coalfield exploring for the first time the changing pattern of climate and ecology in the stratigraphic succession. The revisional study of all the fertile organs of *Glossopteris* have been made to trace the possible relationships and line of evolution among the glossopteridean fertile organs. Classification of all Glossopteridean fructifications of Lower Gondwana was proposed under 17 families belonging to 7 Orders under Glossopteridopsida. Prof. Banerjee described *Ottokaria raniganjensis* and revised study of all the seed bearing Glossopteridean fertile organs.

Several unique new taxa were recorded from the late Early Permian sediments of Indian Lower Gondwana of the Saharjuri basin, an easterly basin of India viz., *Saharjuria, Santhalitheca* and *Chitraphyllum*. Three unique new fertile genera *Sharmastachys* Banerjee and D'Rozario with prominent fertile shoot initially described with equisetalean affinity on revised examination found to be of probable Cycadalean affinity, *Rajmahaliastachys elongata* and, *Tulsidabaria indica* equisetalean fertile shoots, have been discovered. Studies on the morpho anatomy of the bractless equisetalean fertile shoot *Tulsidabaria indica*, a primitive member of Equisetales represents the intermediate stage towards the evolution of *Equisetum* cone and appears to be the possible missing "intermediate" group of plant of Boureau (1964) in the evolution of equisetalean cones .

In 2001, Bera and Banerjee described identical tree ring pattern in the gymnosperm woods from the Late Permian of Antarctica and India suggesting similar palaeoclimate. Banerjee and

Bera in 1998 recorded Zoocecidia on leaves of *Glossopteris browniana* Brongn. This is an important record and traces back the record of ·gall formation in the Glossopteris forest of Permian.

The occurrence of Gondwana rocks in the western Garo hills, India through study of Glossopteris species has been identified by Banerjee Manju, Mitra P. & Chakraborty D.K. in 1977.

These addition to the study of the Indian Gondwana Glossopteris Flora, palynological, palyno-petrographic study of the Permian (Early Permian) coal of Bhutan, Eastern Himalaya and Bangladesh have explored the environment during Permian in the subcontinent.

Banerjee made a thorough study with fossil evidences on the origin and diversification of the modern forest of India during the **Meso-Cenozoic** period.

In this study, the changing pattern of biosphere from Palaeozoic, Mesozoic to Cenozoic also the changing pattern of climate and geography of the Indian subcontinent through time has been discussed elaborately. Movements of the biosphere of the diverse ecosystem including mangrove ecosystem in the eastern Indian subcontinent has been documented with palaeobota-nical data including cuticular feature, microstructures and microplankton of ecological significance. Prof. Banerjee and Prof. Bera worked out the palynostratigraphy of late Mesozoic sediments from Western Bengal Basin, India and identified late Jurassic to Early Cretaceous palynoassemblge.

Research on the **Tertiary-Extra Peninsular** deposits of **India** including thorough investigation on the Siwalik sediments exposed in Darjeeling foothills, and Bhutan have revealed unique data to understand palaeoecology, palaeogeography of the sub Himalayan foothills during Neogne Period. Megafossils recovering cuticles crowded with salt glands *Heliospermopsis* (Nagy) discovered by Banerjee similar to the salt glands of modern mangrove plant leaves and crowded occurrence of epiphyllous fungi including fruit bodies have identified tropical-subtropical climate and estuarine environment with high precipitation in the Darjeeling and Bhutan foot hills in eastern Himalaya during early Neogene Period. Banerjee made a review on the importance of Fungi in understanding ancient ecosystem and together with Pathak recorded significant environment indicator fungal spores from the Neogene succession of Darjeeling foothills in 1984. In addition, a number of epiphyllous fungi has been recrdrd from both Darjeeling foothills and Bhutan Siwalik. The evidences strongly suggest occurrence of mangrove forest in the areas and estuarine environment during Early to Middle Miocene with records of high precipitation similar to tropical rain forest. From Siwalik sediments of eastern Himalaya in the Darjeeling foothills, Bhutan, records have been made on plant animal interaction. During Early to Middle Miocene, the Darjeeling, Bhutan foothills regions had tropical-subtropical climate loving vegetation and in the late Miocene temperate climate loving angiosperm plants and gymnosperms appeared in the areas, with the gradual uplift of the Himalayas during Pliocene-Pleistocene to present.

Tertiary-Peninsular India

Late Mesozoic and early Cenozoic is the most important time period in palaeobotanical-palynological study as the modern plants, particularly, the angiosperms diversified under various climatic and ecological niches during this time. Banerjee exhaustively documented the Palaeobiological evidences supporting the Bio-Geo-Atmospheric changes during Himalayan upheaval in the Indian subcontinent during Palaeozoic, Mesozoic and Cenozoic eras.

Ganga Basin

Palynodata obtained from the late Cretaceous to Early Tertiary sediments of the globe has identified four palaeophytoprovinces in restricted geographical areas. Among these the unique pollen group of Normapolles with specialized morphocharacteristics of evolutionary significance is a well-recognized group for its restricted stratigraphic occurrence in the Upper Cretaceous to Early Tertiary. The group earlier recorded from the specific palaeophytoprovince, viz. Euramerian 'Normapolles province' is recorded from Indian peninsula from Meghalaya Normapolles group of pollen grains in recognizable diversity of more than 20 genera from the Upper Cretaceous sediments of Meghalaya, eastern India by Bharati Nandi. Lately, beatifully preserved rich assemblage of Normapolles pollen grains recorded in the Palaeogene sediments of Ganga Basin, in the central part of India has added new knowledge on the phytogeographical distribution of the plants producing such pollen grains. These studies indicate that reevaluation of the late Cretaceous-Early Tertiary phytoprovinces is needed.

Palaeobotanical-Palynological data from **Bengal Basin** have revealed unique history of deposition of the basin since Upper Cretaceous. Data recovered from Palaeogene, Neogene sediments of Bengal basin from bore core samples obtained through courtesy of the Director Sri S.K Bandyopadhya,Coal Division, Geological Survey of India, Calcutta have explored the phenomenon of sea level changes and coastal evolution in India through millions of years. The bore cores from western margin of Bengal basin near Durgapur have been recovered multiple database of plants and animal remains namely palynoflora, microforaminifera, ostracoda, molluscs, bivalves, ichnofossils etc. from shale, and lignite samples. The results have explored the various important events of Early Miocene transgression of sea up to the western margin of the basin and subsequent regression as recorded by Bera and Banerjee.

Bera and Banerjee described petrified woods having vessel cavities with oolite like strucutre from the **Quaternary** sediments of **Bengal Basin** suggesting shallow marine environment in the Garbeta, Medinipur areas during Quaternary. Two major events of natural activities of Quaternary period namely the tectonic movements for the highest upheaval of Himalayas and the global glacial and interglacial cycles have influenced the changing pattern of bio-geo-atmosphere of the Bengal basin. Oscillation of climate occurred by the effect of these two events causing transgression-regression of the sea which changed the physiography of the basin and formed the world's largest delta, the Bengal deltaic basin. Both the episodes have affected the Bengal basin during late Cretaceous to late Teriary and Holocene epoch and are continuing till now.

It is with the records of the plants and animal remains preserved in the immediate past sedimentary succession (**Holocene**), one can understand the changing pattern climate, geography of a particular area during last several hundred to thousand years precisely, which also helps in suggesting the future trend of such changes. To ensure the reliability of the data to explore the immediate past environment, study of the assemblage from the recent deltaic surface and subsurface sediments in the Sunderbans has been made to understand the depositional environment of the ancient sediments as recorded by Banerjee with her group.

Manju Banerjee and her associates had the opportunity to continue the study of Calcutta Peat initiated by Prof. A.K. Ghosh and could explore data of global interest by identifying the change of climate, geography of southern part of Bengal basin during last 10, 000 years. This was possible through the study of the subsurface sediments exposed during excavation for Metro Railway, Calcutta and excavations of other locations in south Bengal Records of unique assemblages of diverse bio-remains have been utilized to reconstruct the changing biosphere pattern linked with the late Quaternary activities of the geotectonic evolution and glacial deglacial phases by Prof. Banerjee and P.K. Sen. The studies have explored unique data revealing the episodes of Holocene sea level changes. The Holocene (last 10ka) time has witnessed the evidences of Sea level change all over the globe. High sea level during Holocene occurred during 6500yr BP. with the advancement of the global Holocene deglacial phase. Landward migration of the sea by the effect of the world wide transgression, the Flandrian trasgression also known as *Ammonia* (Microforaminifera) transgression occurred in the Bengal basin and the coastline advanced up to Kolaghat, Kolkata, Dum Dum, Barrackpore 6650 years ago. The phenomenon of transgression of the sea causing sea level rise in the Bengal basin has been beautifully identified with the records of diverse biological remains viz.; palynomorphs, all parts of mega plants, *in situ* plants, sporangia on fertile pinna, diverse micoflora, microplanktons, invertebrate, vertebrate ichno remains etc. The records together with the sea level curve has been included in the book "World Atlas of Holocene Sea Level Changes" by Pirazzoli and Pluet, 1991. This is a pioneer contribution on Holocene sea level change in the Indian subcontinent. With the landward migration of the sea mangrove forest (Sundarbans) migrated upto Kolkata, Kolaghat, Dumdum, and Barrackpore areas by 6500 YR.BP. *In situ* roots of *Heritiera fomes* stems, leaves, flowers, hypocotyls spores, pollen grains of all the major plants of the mangrove forest viz., *Aviceinnia, Sonneratia* and *Rhizophora* have been recovered from the subsurface sediments.

The radiocarbon dated peat layers, and plant materials have explored the changing pattern of the forest ecosystem in time during Holocene in the Bengal Basin. The environment of deposition as explored from the Type section at Calcutta (Netaji Subhash Station) reveals the phase of arid upland Barren condition (>7030 yr. BP) followed by Shallow marine true mangrove forest (6650-7030 yr. BP), Tidal mangrove forest (6210-6650 yr. BP), brackish water mixed fresh water delta top forest (5000-6210 yr. BP), predominantly fresh water with slight brackish water influence (3470 yr. BP). This is a unique example of the fact how nature works slowly and silently and teaches us to follow Nature's activities to protect the forests, also the Human community. The coast line receded several kilometers towards south. Brackish water delta front environment prevailed at Namkhana south of Calcutta during 3170 yr. BP Subsequently the coastline migrated to present position without any major indication of sea level rise till now; the delta creation and destruction is however going on as a natural process. Palaeobiological records have revealed the pattern of delta evolution in the Bengal basin.

Holocene peat layers collected from Bangladesh have revealed a rich palynoflora which has been correlated with the results obtained from the peat deposit of south Bengal, India. Chakraborty and his group studied Holocene precipitation variation from the Carbon Isotopic Composition of Sediment Organic Matter from the peat layers of South Bengal Basin.

Archaeobotany

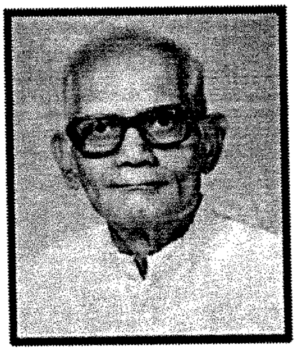
The archaeological sites of West Bengal were developed in the major river valleys and ancient coastal regions. The change in the position of the archeological sites occurred with the changed Physiography of the basin. The socio-economic evolution in West Bengal has occurred simultaneously with the prolonged dynamic activities from upper to lower parts of the deltaic basin of West Bengal through Paleolithic, Mesolithic, Neolithic—Historic time. Compared to the other sites of India, archaeobotanical records from West Bengal is poor. A collaborative study was undertaken to investigate the archaeobotanical aspect of the archaeobotanical sites of West Bengal by Manju Banerjee, Professor and In-Charge of Palaeobotany-Palaynology Section, Dept of Botany, University of Calcutta and Prof. Chitrarekha Gupta, Head, Department of Archaeology of the same University with the intention to develop archaeobotanical study centre. Very promising collection of diverse biological remains was made for the first time from the archaeological sites of gangetic West Bengal and a multidisciplinary study with the samples have been made together with Ruby Ghosh. Multidisciplinary approach of researches in the archeological sites is gaining enormous attention in recent years all over the globe to explore the immediate past environment.

A Museum has been made by Prof. Banerjee in the Palaeobotany Section since 1975 to preserve the Type specimens and slides and other valuable specimens.

Prof. Subir Bera is now in-charge of the Palaeobotany and Palynology section of the department of Botany. He has made researches with exceptional findings on Palaeobotany and Palynology, also on many other applied field of studies with a large group of students.

EMINENT TEACHERS

Prof. Amiya Kumar Ghosh (1905-1985)



Designation : Professor of Botany, University of Calcutta

Academic qualification : Master Degree in Botany, University of Calcutta, 1928

Academic experience : Museum Assistant with the Geological Survey of India.

Sir Rash Behari Ghosh Research Assistant under late Professor S.P. Agharkar Professor in Botany, 1929-1936

Lecturer in Botany, University of Calcutta, 1937-1947

Registrar of the Bose Institute, Calcutta, 1948-1956

Senior palynologist, Oil and Natural Gas Commission, Dehradun, 1957-1963, where he established the Palynology Laboratory.

On retirement from the ONGC in 1963, he returned to the Botany Department, University of Calcutta and remained actively associated with it in various capacities till the last day of his life.

He convened the first All India Symposium on Palaeopalynology and Indian Stratigraphy in 1971 and published the Proceedings of the seminar in 1972.

Recognitions :

Founder-Secretary of the Botanical Society of Bengal, later President.

Fellow of the Geological, Mining and Metallurgical Society of India

Fellow of the Palaeontological Society of India

Fellow of the Palaeobotanical Society of India

Awarded the Geological, Mining and Metallurgical Society's Medal (1946-1947).

Received Bruhl Memorial Medal from Asiatic Society in 1983.

Nominated to receive Gunnar Erdtman Medal instituted by the Palaeobotanical Society of India (1984-1985) but met death before the Medal could be awarded to him.

Research activities :

Initiated palaeobotanical study in the Botany department, University of Calcutta and from the initial phase and introduced a number of pioneer and internationally recognized significant researches on diverse fields of interest of basic and applied aspects.

Prof. Jitendra Kumar Sen (1921-1966)

Designation : Professor of Botany, University of Calcutta

Academic qualification : M.Sc. in Botany Ph.D. Botany (Palaeobotany) - 1970

Academic experience : Research Scholar under late Professor A.K. Ghosh in 1942

Research Scholar in the Forest Research Institute, Dehradun, 1945-1947.

Lecturer in Botany, University of Calcutta, 1947-1961.

Research Associate at Stockholm and Glasgow with Prof. O.H. Selling and Prof. John Walton, respectively, 1956-1958.

Superintendent, Indian Botanic Garden at Sibpur. West Bengal Government Service in 1961

Deputy Director, Botanical Survey of India, with the transfer of the Indian Botanic Garden, to the Government of India in 1963.

Honorary lecturer, Department of Agriculture, University of Calcutta, and in the Bengal Engineering College, Sibpur.

Recognitions :

Received the E.J. Garwood award of the Geological Society of London, in recognition of his valuable contribution to the field of Palaeobotany, in 1961,

Fellow of the Geological Society and of the Linnean Society of London, and of the Geological and Palaeontological Societies of India.

Vice-President of the Botanical Society of Bengal.

Publications :

He published about 50 papers in journals of International repute.

List of Ph. D students under Professor A.K. Ghosh

Prof. Manju Banerjee, Prof N. N. Bandyopadhyay, Late Dr Ajit Pal, Dr. D. Banerjee, Dr. Bharati Nandi, Dr. Ratna Sharma

Prof. Manju Banerjee

Designation : Professor of Botany, University of Calcutta

M.Sc. Ph.D (Cal) FNASc, FLS (Lond), FGS (IND), FIFS, FPbS

Academic qualification : M.Sc. in Botany, University of Calcutta, 1960, Ph.D. Botany (Palaeobotany)—1970

Certificate course in Coal Petrology—1981 Indian School Of Mines

Certificate course in New Concepts—1983 & Methods in Stratigraphy IIT, Kharagpur

Subject of Specialization : Botany: Palaeobotany-Palynology, Palaeobiology, Biostratigraphy, Environment, Coastal evolution, Palaeoshoreline, Palaeogeography, Permian to Holocene, Extant plant external internal morphology,ecology

Recognitions :

2004 President, Indian Association of Angiosperm Taxonomy (IAAT).
2003 Fellow, Geological Society of India (G.S.I.)
2002 Elected Fellow, Indian Fern Society
2001 Elected Fellow, National Academy of Science, (FNASc), Allahabad
2000 Elected Fellow, Linnean Society of London.
1994 Elected Fellow, Indian Association of Biological Sciences
1985 Elected Fellow, Palaeobotanical Society of India

Guided Ph. D. Students : University of Calcutta-9 and Nanjing Institute of Geology and Palaeontology, China-1. Invited to co-Supervise Ph.D. Thesis jointly with Prof. Dr. Zhou Zhyian Professor of Palaeobotany, Member Chinese Academy of Science, Ph.D. student Li Jianguo working on Tibetan Tertiary sediments under India-China Exchange Programme

Contribution to promote Teaching of Palaeobotany in Schools, Colleges and Universities.

Prepared educational program in the **UGC Countrywide National Telecast Educational Program** on

1. **Plant Fossils :** in 5 parts viz.; i) Nature's own Museum ii) A study of Nature's Museum iii) The Evolution from Algae to Angiosperm iv)Biosphere of the Past v) The moving Biosphere of the moving continents-Original in English, translated in Hindi and Bengali. First Telecast in the consecutive five weeks of March-April, 1990, 1995 and 1998.
2. **Exploring Eden :** Origin and movement of mangrove forest–Telecast in April, 1998.

Research Publications : Published more than 120 full research papers in International, National journals, in addition popular articles in English, Bengali.

PLANT PHYSIOLOGY

Dr. Sourindra Mohan Sircar, the leading plant physiologist of the twentieth century, established the Plant Physiology and Biochemistry Laboratory, University of Calcutta, when he was appointed as Assistant Lecturer in the Department. He successively served as a Lecutrer and Reader and in 1960, succeeded the late Dr. I. Banerji as Head of the Department. He was soon after appointed to the Chair of Sir Rash Behari Ghosh Professor of Botany.

Dr. S.M. Sircar initiated and organized the Plant Physiology Laboratory of the University for teaching and research that became an active centre of research in India.

While teaching in the University of Calcutta, he joined on deputation as Head of the Department of Biology, Decca University (now in Bangladesh–1946-47) and as Professor of Agricultural Botany at the Central College of Agriculture, New Delhi (1949-51).

After Professor Sircar left this department to assume the post of the Director, Bose Institute, Dr. Subhendu Mukherji joined the teaching faculty of Calcutta University in 1968 as a Lecturer in Botany and then served as a Reader in Botany. In 1983, he became Professor of Botany, and then retired from service in 2002. Dr. Mukherji had published more than 140 research papers in reputed journals. Jointly with Dr. Ashim Kumar Ghosh, he has written a Text Book of Plant Physiology published by New Central Book Agency, Kolkata. 40 research students have obtained their Ph.D. degree under his supervision. Under Indian National Science Academy–Royal Society Exchange Program, Dr. Mukherji spent a period of visit to UK and worked with Prof. P.F. Wareing at the Department of Botany, University of Wales, Aberystwyth, UK.

After retirement from Presidency College, Dr. Chittatosh Datta joined the teaching faculty of this department in 1968 and used to take classes in different aspects of Plant Physiology with special emphasis on photosynthesis, photorespiration and plant pigments.

Dr. J.C. Sengupta, the then Principal and Senior Professor of Botany, Presidency College and Dr. J.K. Choudhuri of the same College made useful contribution toward teaching in PG classes. Dr. B.B. Biswas, Professor of Biochemistry, Bose Institute used to deliver a course of lectures to this M.Sc. students.

Dr. Prasanta Kumar Sircar joined the teaching faculty of Calcutta University in 1970 as a lecturer in Botany and then served as a Reader in Botany. He became Professor of Botany and served in this capacity till his retirement. Dr. P.K. Sircar had more than 50 published papers to his credit and 5 research students have obtained Ph.D. degree under his guidance. The major areas of research in which Dr. Sircar is interested are (a) immunology based on antigen and antibody dissociation, (b) viral protein synthesis and fingerprinting of viral proteins, (c) plant hormone isolation and characterization, (d) plant lectins and their role in host-parasite interaction.

Dr. Asok Kumar Biswas joined the teaching faculty as Reader in Botany in 2004 and then became Professor of Botany in 2010 in which post he is serving at present.

Research activities in Plant Physiology and Biochemistry Laboratories at the Department of Botany, University of Calcutta

Vernalization and Photoperiodism

In the early forties, Dr. S.M. Sircar worked extensively on vernalization and photoperiodism. These studies indicated that induction of early flowering of rice would be achieved by the application of short day treatment to seedlings for varying periods and that the photoperiodic effect of short days is of quantitative nature as the degree of earliness for flowering increases with duration of treatment.

The phenomenon that the photoperiod-sensitive *aman* rice varieties flower at a fixed day length occurring twice in a year was observed by Sircar and his associates in the late forties. The Department of Agriculture, West Bengal adopted this practice of double cropping. From August to next April, two crops of *aman* rice could be cultivated with proper irrigation facilities. A remarkable influence of short days on the reduction of flowering time from 133 to 47 days was recorded in the winter variety, *Rupsail.*

Mineral Nutrition

Studies on the nutrition of the rice plant by Sircar formed the basis of the fertilizer requirements of the 'indica' varieties. It was noted that in the absence of adequate levels of phosphorus, rice plants fail to metabolize inorganic nitrogen to protein resulting in an accumulation of soluble nitrogen and reduced growth. In the study by D.P. Bhattacharya, S. Mukherji and K.K. Kundi on the physiology of lodging habit of rice, it was found that when nitrogen is applied in conjunction with potassium, the mechanical rigidity of the stem is improved.

Seed Germination

It was noted that the failure of germination of rice seeds is realted to the formation of supraoptimal concentration of IAA and inhibitors like coumarin, sinapic, ferulic and abscisic acids. S.M. Sircar and his associates like P.K. Saha, S.N. Ganguly and P.K. Sircar also studied the profile of inhibitors of *Shorea robusta* seed which becomes non-viable only after two weeks from fruiting.

Naturally Occurring Hormones

Several tropical plants like water hyacinth, *Borassus flabellifer*, *Cassia fistula, Fraxinus* sp. were examined for their profiles of growth regulating compounds. This group including P.K. Sircar, S.N. Ganguly and T. Ganguly isolated tetrahydrogibberellic acid from *Sonneratia apetala*, indole inhibitor Rhizophorine and an indole rhamnoside from *Peltophorum ferrunginoum.*

Photosynthetic Efficiency of Rice Plant

So far as grain yield is concerned, it was clearly demonstrated by S.M. Sircar and M.N. Das that the local tall 'indica' varieties are not photosynthetically less efficient, rather some of them are more efficient than the short 'japonica' varieties, but deficiency in transport to the grains is the cause of relatively low yield in the former. The accumulation of photosynthates in the source leaf followed by the reduction in photosynthetic rate was noticed as a result of removal of sink panicle.

Characterization of heavy Metal Toxicity in different Plant Materials and effects of Automobile Exhaust Pollution on Roadside Plants

Research on the effects of deleterious concentrations of heavy metals on plants and their mode of action was done for more than two decades by S. Mukherji and his associates. Heavy metals cause an overall disruption of different metabolic processes occurring in the cells, the resultant effect being manifest in the inhibition of cell division and consequent retardation of growth. Toxic metals are capable of causing a reduction in the activity of hydrolases, like amylase, phosphatase, RNase and protease in germinating seedlings, whereas the activities of catalase, peroxidase, IAA oxidase and ascorbic acid oxidase undergo considerable stimulation. Phytotoxic effects of cadmium on nitrogen fixation, nitrate reductase and leghemoglobin content of root nodules of mungbean have been described. The effects of cadmium have been characterized on several glycolytic enzymes and photosynthetic CO_2 uptake together with ultrastructure of leaf and nodule of mungbean.

Plants growing along highways are exposed to pollution caused by automobile exhaust gases. Different physiological and biochemical characters of such plants have been worked out by R.K. Sarkar, A. Banerjee, M. Mandal and others to determine suitable bioindicators of atmospheric pollution and also protection species.

Stress Physiology

The influence of salt stress on chlorophyll content, conversion of protochlorophyll to chlorophyll, chlorophyllase enzyme activity, photosynthetic non-cyclic electron transport and CO_2 uptake in a C_3 glycophyte mungbean were studied by Mukherji and Chakraborty. The inhibitory effects of salinity stress were either completely or partially reversed by the application of IAA, GA_3 and kinetin used as foliar spray.

Penicillin effects on growth and Metabolism of Higher Plants

Several publications from this laboratory by S. Mukherji and A.K. Biswas have established the role of Penicillin in higher plant metabolism. Penicillin, the well known antibacterial antibiotic, is reported to affect plant metabolism by promoting several hormone regulated phenomena. Penicillin has been shown to behave like gibberellins in inducing amylase and ribonuclease synthesis in deembryonated rice endosperm (half seed) system. Penicillin can mimic cytokinins not only in enhancing chlorophyll formation but also in retarding senescence by chlorophyll preservation. Penicillin can promote rooting of cuttings and establish apical dominance which are audin-regulated phenomena. Endogenous gibberellins and cytokinin levels have been shown to be enhanced in intact seedlings following Penicillin treatment. Penicillin regulation of leghemoglobin, Hill activity, net photosynthesis and ultrastructure of nodule and chloroplast in mungbean formed another part of study. Besides Penicillin, effects of two other antibiotics like streptomycin and chloramphenicol on several physiological parameters have been reported.

Introduction, Screening and Effective Utilization of Laticiferous Plants as incessant and renewable Source of Petroleum Hydrocarbons

Laticiferous plants contain hydrocarbons as secondary metabolites which can be used as fuel hydrocarbons. These plants are the most obvious alternative renewable source of fuel. Among five latex-bearing plants selected for study, *Pedilanthus tithymaloides* was primarily evaluated by Mukherji, Bag and De as an incessantly renewable and potential source of hydrocarbons. Extracts were obtained from successive extraction of whole plant material with solvents like petroleum ether, benzene and ethyl acetate. A white amorphous mixture of hydrocarbons was obtained by petroleum ether elution which was comparable with gasoline.

Metabolism of Rice Seeds during Storage

A positive correlation of respiration with a decrease in germination percentage and the length of seedlings and a negative correlation with days of storage were established by S. Mukherji, Jayanti Mukherjee and A.K. Paul. A strong correlation existed between catalase and peroxidase activities with respiration, indicating that the activity of these enzymes can be used as an indicator of metabolism.

S. Mukhrji and A.K. Paul worked on metabolic changes in the rice seeds stored for 7 years indicate that with aging of the seeds, there is a rise in the moisture level, reducing sugar, free fatty acids and acid value of fat while sucrose and fat contents decline by hydrolysis during storage. Activities of hydrolyzing enzymes show a fall as the seeds become older.

Metabolism of Germinating Seeds

S. Mukherji and B. Dey showed that ungerminated seeds contain about 80% of their total nicotinic acid in the bound form which becomes partially free in course of germination. Conversion of nicotinic acid to its nucleotide derivative NAD is noted. NAD and NADP are the common preexisting coenzymes in dry seeds but is appears to be deficient for normal metabolic demand and are quickly synthesized during first 24 h of germination. A combined pattern of NAD dominance in the early stage and then NADP in the later stages of germination is observed.

Information on the phosphorus compounds has been provided and the changes they undergo during rice seed germination have been elucidated. In ungerminated seeds, the bulk (about 80%) of total P appears in phytin. It is then dephosphorylated in course of germination with simultaneous accumulation of inorganic P.

The effects of temperature treatments on rice seeds in the early imbibitional phase were studied by Mukherji, Paul and Jayanti Mukherjee with respect of changes in germination percentage, seedling vigour, water uptake, respiration and hydrolytic enzymes. As compared to control, 50°C treatment for 30 min enhanced these parameters showing beneficial effects.

S. Mukherji and A.K. Paul showed that in completely water-logged condition, rice seedling growth never proceeds beyond coleoptiles stage and there is no sign of emergence of second leaf. Treatment with hydrogen peroxide or exposure to white light are effective in releasing the suppression of second leaf growth indicating that the lack of oxygen in sufficient amount in water is the major cause of dormancy of second leaf.

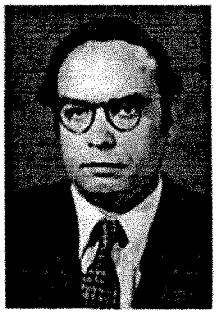
P.K. Sircar

Research has been done by P.K. Sircar and his group on plant lectin and its role in plants. Several lectins have been isolated from different plants. Fir hos-parasite interaction, the role of lectins as affinity molecule is a subject of study. Another line of research interest is whether lectin acts as immunogenic molecule or not like that of animal system.

Dr. P.K. Sircar and this group also isolated medium sized (0.5 to 3 KD) peptides from different plant materials by ultrafiltration and through sephadex LH20 column and also characterized these peptides.

EMINENT TEACHERS OF PLANT PHYSIOLOGY

Professor Jatis Chandra Sen Gupta



Research Activities

Prof. J.C. Sen Gupta worked on rheotropism–the phenomenon in which roots bend towards a stimulus at Heidelberg. He established for the first time that roots bend in running water not as a result of hydrostatic pressure but in response to chemicals, particularly electrolytes. To-day we know a lot about lectins, ion-pumps and the cause of differential growth but nothing about the nature of signal transduction mechanism in relation to existence of electrolytes in the environment.

He returned to India in 1928 with a Dr. Phil. Nat. degree and joined the Presidency College, Calcutta in 1929. Research activities in the Department of Botany were then developing with Surendra Chandra Bandyopadhyay working on plant systematic. He began his research studies in this institution working on unusual plants, like mangrove plants growing in saline regions of the Sunderbans and insectivorous plants like *Aldrovanda vesculosus* as also plants growing at high altitudes of Darjeeling, indicating his profound interest in ecological physiology. He worked extensively on osmotic quantities, chloride functions and localization of sodium ions in plant cells.

He soon became Senior Professor of Botany, and in 1939 became the Head of the Department of Botany, a position which he held for 11 years until he became Principal of the College in 1950. During this period he became very much interested in the physiology of crop plants and contributed considerably to our knowledge of nutrition, growth and development–of most of our economically important plants. The plant in which he was most interested was the fibre plant–

jute–which grew largely in the Gangetic plains, particularly Bengal–and was one of our major foreign exchange earners. Jute, like rice, prefers rainfall and high humidity but hates unlike rice, water-logged conditions–as it slows down root growth, presumably due to anaerobic conditions. His very detailed studies with jute showed that osmotic values were highest during the vegetative period, declined at the time of flowering, followed by a rise at about fruiting, after which decay set in. He also showed that osmotic values were never proportional to water supply due to rainfall. Such detailed studies on osmotic values of crop plants are rare.

By this time, as desired by his teacher P. Brühl, he had collected around him a band of dedicated colleagues and students, which included Nirod Kumar Sen, Dhruva Kumar Mukherjee and Santosh Kumar Pain. Later Gita Sen, Salil Kumar Chattopadhyay, Sumitra Talukdar, Dwijendranath Guha Bakshi, J.R. Saha and Prabit Guha Thakurta joined this group and made important contributions to the physiology of many crop plants. He suggested, after studying the deficiency effects of major essential elements, the optimum levels of manuring of jute plants. He showed that while *Corchorus capsularis* was more sensitive to P-deficiency. *C. olitorius* was more affected by K-levels. Both species, however, required high N- and Ca-levels, depending on cultivars. He was also a good proponent of hydroponics and confirmed his observations with solution cultures.

Early in the forties of the last century Indian plant physiologists became very much interested in Lysenko's Theory of Phasic Development in Plants, in view of tall claims made by Lysenko for early flowering of plants. Sen Gupta was one of the first persons to be interested in vernalization and photoperiodism of a large number of crop plants which included in addition to jute and several other fibre plants, late-sown Aman paddy, oil seed crops like mustard and sesamum, millets like sorghum, legumes like mung, groundnut and soyabean, and tobacco. Mustard is recognized to be the only plant which significantly responds to vernalization and photoperiodic treatment, but Sen Gupta showed that it is not so for all cultivars and strains, indicating that such responses are varietal and not species characters. Vernalization treatments involving low temperature treatment of seeds had little or no effect in tropical crops.

In jute he showed that most varieties of jute are shortday plants and *C. olitorius* is more responsive than *C. capsularis*. The critical dark period is 11.5 h and cutting off the morning sunlight is more effective than that in the afternoon. He also studied the effects of interruption of the dark period on flowring of jute plants. That photoperiodic induction leads to formation of the floral stimulus in the leaves of jute was demonstrated by grafting experiments as shown earlier in the case of *Xanthium* by Karl Hamner. A remarkable effect of photoperiods that he observed in jute was a very unusual increase of vegetative growth. A more surprising observation was the heteromorphism observed in *Sesamum*. While the genetic basis of floral organ development has now been largely worked out, nothing is known about the molecular basis of unusual stimulation of vegetative growth or leaf heteromorphism in relation to gene action and environmental changes.

Since jute is a phloem-fibre plant, vegetative growth is desirable, but fruits and seeds are required for propagation for which West Bengal depends on other states to a large extent. Seed formation in jute also did not escape his attention throughout his studies.

For minimum utilization of land area which maximum vegetative growth or early flowering, it is imperative that a date of sowing is determined for each variety of crop for optimum effects and he carried out extensive investigations on this aspect of several plants, particularly jute, which are of considerable importance. In several cases, photoperiods or hormones (34, 48) were applied to study if germination and yield could be increased further.

Not only jute, three other fibre-yielding plants, *Hibiscus sabdariffa* and *Hibiscus cannabinus* as also *Crotalaria* engaged his attention, *Crotalaria,* a legume, is also a green manure crop and its optimum growth is desirable both for fibre yield and green manure production.

Late in the forties he became very much interested in the physiology of pulses like mung, soybean, and lentil, as also groundnut, particularly in relation to their water requirements, vernalization and photoperiodic responses, and dates of sowing for best performance, Pulses are generally grown in the Rabi season when daylengths shorten and there is a belief that they need very little water. This latter view is not quite true and he determined their proper water requirements for growth and nodulation. His findings along with those of others showed that many Indian cultivars do respond to vernalization treatments but the earliness is rather small and not very useful for agricultural purposes.

He also contributed significantly to the development of horticulture in India, particularly in relation to fruitset, seedlessness and rooting of cuttings being one of the first persons in India to initiate studies in these areas. In some of the experiments 2,3,5-triiodobenzoic, an auxin-antagonist was used. Such studies have helped in understanding the hormonal physiology of these processes which are now used extensively in agriculture.

Professor Sourindra Mohan Sircar

Designation : Professor and Head, Department of Botany, University of Calcutta

Academic qualification : M.Sc. in Botany, University of Calcutta 1931; Ph.D., London University; D.I.C., Imperial College, London.

Academic experience :

- Lecturer in Botany, University of Calcutta 1937-42
- Reader in Botany, University of Calcutta 1942-59
- Sir Rash Behari Ghosh Professor of Botany & Head of the Dept., University of Calcutta 1960-68.
- Director, Bose Institute 1968-75.
- Worked on deputation as Head, Department of Biology, Dacca University (Bangladesh) 1946-47 and Professor of Agricultural Botany, Central College of Agriculture, New Delhi 1947-51.

- After retirement from Bose Institute, he rejoined Calcutta University as Emeritus Scientist of ICAR.

Recognition :

- Elected Fellow of Indian National Science Academy (FNI) in 1954
- Fellow of Asiatic Society 1966
- President, Indian Botanical Society 1969
- Awarded Bruhl Memorial Medal 1966
- President, Indian Botanical Society 1969
- Awarded Birbal Sahni Medal 1970
- General Secretary (1972-75), Treasurer (1968-71), President, Botany Section (1963) and General President (1977-78) of Indian Science Congress Association
- Awarded Rafi Ahmed Kidwai Prize and Medal by ICAR
- President–Botanical Society of Bengal, Indian Society for Plant Physiology, Indian Photobiological Society, Plant Biochemical Society.

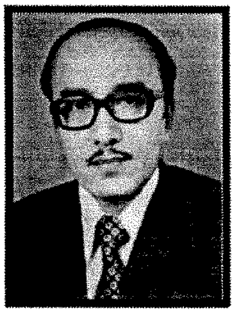
Dr. Sircar represented the Indian Science Congress Association at the Annual Meeting of the British Association for the advancement of Science in England in 1969 and the bicentennial meeting of the American Association for the Advancement of Science in Boston in 1976.

Dr. Sircar conducted an International Symposium on "Plant Growth Substances held in January 1967 in the department of Botany, Calcutta University of edited its proceedings.

Dr. Sircar was elected an Honorary Fellow of the German Academy of Natural Science in 1974 and a Vice-President of the International Botanical Congress at Leningrad in 1975.

The major areas of research interest of Dr. Sircar were (a) Vernalization and Photoperiodism, (b) Mineral nutrition with special reference to rice plant, (c) Lodging habit of rice plant under heavy fertilizer stress, (d) Plant hormones : isolation, identification and characterization from natural sources, (e) Physiology and biochemistry and seed development and germination. Identification of inhibitors of germination, (f) Photosynthetic efficiency of 'indica' and 'japonica' rice.

Professor Subhendu Mukherji



Designation : Professor of Botany, Head, Department of Botany, University of Calcutta (1988-90)

Academic qualification : M.Sc. in Botany, University of Calcutta 1958; Ph.D. in Botany, University of Calcutta

Academic experience :

- Lecturer in Botany, Serampore College 1959-61
- Research Assistant in Research Scheme of ICAR 1961-64

- Research Officer in Research Scheme of PL 480 1964-68
- Joined the Department of Botany, Calcutta University as Lecturer in 1968, became Reader in 1976 and Professor of Botany in 1983. In charge of Plant Physiology & Biochemistry Section

Recognition :

- Life Member – Indian Science Congress Association & Indian Society for Plant Physiology
- Elected Fellow of Indian Society for Plant Physiology (FISPP)
- Member – Society for Plant Physiology & Biochemistry, Indian Association of Biological Scientists.
- Served Botanical Society of Bengal as Secretary (twice), Treasurer, Editor, Vice-President & President.
- Founder Member–Plant Physiology Forum

Research activities :

140 research papers have been published by Dr. Mukherji and his associates. 40 research students obtained their Ph.D. degree under his guidance.

The primary research areas in which Dr. Mukherji and his associates were engaged are (a) Characterization of heavy metal and metalloid toxicity in higher plants and algae, (b) Growth regulating properties of penicillin in higher plants, (c) Influence of water and salinity stress on growth, metabolism and productivity of crop plants, and (d) Environmental pollution in general with special emphasis on impact of automobile exhaust on roadside plants.

Professor Prasanta Kumar Sircar

Dr. Prasanta Kumar Sircar had his education from Presidency College, Calcutta and the University College of Science, Calcutta University. After passing the M.Sc. examination in Botany, Dr. Sircar started his research career under the supervision of Professor S.M. Sircar and was awarded the Ph.D. degree in Botany, Calcutta University in 1970 on a thesis concerned with plant hormone isolation and characterization.

Dr. P.K. Sircar joined the teaching faculty of Calcutta University in 1970 as a Lecturer in Botany and then served as a Reader in Botany. In 1993 he became Professor of Botany and served in this capacity till his retirement in at the age of 65 years. Dr. Sircar has more than 50 published papers to his credit and 5 research students have obtained Ph.D. degree under his guidance.

Teaching Experience : He used to teach Plant Physiology, Biochemistry and Immunology.

Research Experience

During brief post-doctoral training in immunology, Dr. Sircar worked on antigen and antibody dissociation in different conditions. There are methods (i.e. urea, high pH etc.) by which they can be dissociated and in many cases they lost their biological property. Dissociation in different (Mild conditions) liquid phase under Beckman Model E analytical ultracentrifuge and their biological properties were studied by him. He had experience on nephalometric method of hapten estimation by coupling with BSA and raising antisera with these.

He worked on vesicular stomatitis viral protein synthesis, finger printing of viral proteins, preparation of viral RNA by RNA synthetase. Separation of L-cell membrane bound viral protein during initial state of viral infection and protein synthesis.

Plant hormone isolation specially gibberellins, cytokinius by column and TLC from different plants and their structures were elucidated by UV, IR and mass spectrum analysis. A new gibberellins and few other growth regulating compounds have been characterized. He developed one immunoassay for plant hormone abscisic acid. Recently they are studying the cytokinin concentration (qualirtative and quantitative) free and tRNA bound form of plant of different stages of physiological conditions i.e. budding, germination, flowering etc. They noted that basipetal fall of cytokinin concentration gradient from grains to the lower 3rd leaf helps rice grain filling.

Dr. Sircar also worked on plant lectin and its roles in plant. They have isolated several lectins from different plants. For host parasite interaction, the role of lectins as affinity molecule is subject of study. Another line of research interest is whether lectin acts as immunogenic molecule or not like that of animal system.

Following scholars did their Ph.D. under Prof. Sircar.

1)	Dr. Biswa Nath Ghosh	1984	4)	Dr. Indira Iyer	1987
2)	Dr. Shyamali Saha	1984	5)	Dr. Bikash Kundu	2000
3)	Dr. Ashim Kumar Ghosh	1985	6)	Dr. Palash Mandal	2014

CYTOGENETICS

The history of the Cytogenetics Laboratory of the Department of Botany, University of Calcutta, goes back to the time when Prof. A.K. Sharma (the then, Shri A.K. Sharma) joined this University in 1948 as an Assistant lecturer, after the departure of Prof. P.N. Bhaduri to IARI, New Delhi, under whom Prof. Sharma had his initial training in chromosome study.

Since then, the emphasis of this laboratory was focussed towards innovation of new methods for chromosome analysis-physical, chemical and ultrastructural, with the principal objective of study of *chromosomes with clarified finer details, from any organ of the plant*. As a result, a number of techniques involving the use of several compounds like, *isopsoralone*, *umbelliferone*, *aesculine* and several other *coumarin derivatives*, as pre-treatment agents were worked out and used in chromosome study. These techniques are now used all over the world for chromosome analyses.

From 1972, the University Grants Commission granted this department, the status of selected department of Special assistance with reference to chromosome research, based on the recommendations of a UGC Expert Committee for further strengthening of the existence of "School of Chromosome Research". During this period, the Cytogenetics Centre was selected as a component of Indo-British Collaboration Programme on Chromosome research with the Department of Plant Biology, Queen Mary College, University of London and Department of Botany, University of Nottingham. In addition, the Cytogenetics Centre was also included under Indo-USSR and INSA-JSPS Programme involving various facets of chromosome research and exchange of scientific staff. During this period, pioneering work was done towards the development of new techniques for the study of finer details of chromosome structure. Extensive studies were performed related to the role of chromosomes in evolution, in reproduction, and in differentiation. A new concept of speciation through genetically controlled chromosome mosaicism in the somatic tissue was developed at the Cytogenetics Centre as a direct consequence of the research being conducted here. Novel methods to study the chemical nature of chromosomes stressing on *in situ* analysis were developed through cytophotometry, enzyme digestion, amino acid tests and differential acid extractions. Chromosomes in relation to genetic disorders and genetic toxicity, and the effects of physical and chemical agents on chromosomes in context of environmental mutagenesis were also explored in detail.

In 1980, the Cytogenetics Centre at the Department of Botany, University of Calcutta, was elevated by the University Grants Commission to the "Centre of Advanced Study on Cell and Chromosome Research" and several new areas of chromosome research were initiated. In addition to the original mandate of studying the role of chromosomes in evolution, in reproduction, and in differentiation, emphasis was also laid on DNA profile in relation to speciation and adaptation, organogenesis *in vitro* and *in vivo*, environmental mutagenesis and genetic toxicology tested through different test systems with special reference to genetic polymorphism, metal-metal interaction, as well as, nucleolar metabolism. Studies were also conducted on fuel wood species, and on mutagenesis *in vivo* and *in vitro*. Chromosome analyses, especially study of spontaneous and induced chromosome breakages, DNA estimation, mutagenesis and the effect of different environmental agents on different plant systems are also studied in great details. It was first worked out from this laboratory that any metabolic change or milieaux for growth for plant system may ultimately lead to chromosome break, as exemplified by chromosome breaks in even water distilled in metallic distillatory. Studies were also extended to medicinal plants, covering both their *in vitro* and *in vivo* behaviours, and the study of secondary metabolites with respect to genotypic diversity.

For the next two decades, the Centre extensively developed and utilized *in vitro* techniques not only as a means of propagation, but also genetic intervention in pathways of secondary metabolites, and genotypic responses. Chromosomal damages and targeting of sequences associated with normal and aberrant cultural behaviour are being focussed on. Successful studies have been carried out in securing commercial products like tea, cashew and medicinal plants, including Taxol, Podophyllotoxin, Scillaren, Withasteroids, Forskolin, and a host of others, some of which are in a pilot scale of production stage and are patented as well. The successive Programme Co-ordinators after Prof. A.K. Sharma, namely Professors Archana Sharma, Sumitra Sen, Amiyanshu Chatterjee,Ranjit Mallick Sibdas Ghosh, Satyesh Roy and Sumita Jha had all been following the initial mandate, with gradual expansion and modifications, keeping pace with emerging trends of chromosome research.

Over 200 students obtained their Ph.D. and D.Sc. degrees from this laboratory since its inception, and many of them are holding important teaching and research positions, not only in India, but all over the world. Teacher Fellows from all over India, sponsored by the University Grants Commission, were engaged in study of different aspects of chromosome research. Prominent Teacher Fellows include Kanaka Rao, Nigar Alam, Maharaj Kishen Peer, YS Bansal, Tuntun Kumar Prasad, Suresh Chand, Moti Misra, Abhoy Ghosh, Biswanath Mukherjee, and UC Lavania.

More than 500 research publications have emanated from the Cytogenetics Centre, in peer reviewed journals, including Nature, Stain Technology, Botanical Review, Biological Review, Experientia Chromosoma, Genetics, Euphytica, International Review of Cytology, International Journal of Histo-Cytochemistry, The Cell Nucleus, Plant Cell Reports, Genome, Mutation research, Chemosphere, etc .

In addition to publications in peer-reviewed journals, the Cytogenetics Centre has been publishing an international journal of cytology, The Nucleus, since 1958, with an editorial board eminent international experts including Late CD Darlington. It was inaugurated by the editorial board at the International Genetics Congress at Montreal in 1958. Since 2010, the publication of this journal has been taken over by the reputed international publishers, Springer.

The standard text-cum-reference book on chromosome, emanating from this laboratory entitled 'Chromosome Techniques-Theory and Practice' by A.K. Sharma and A. Sharma

(Butterworth, London) 1965, 1972, 3rd Edition 1980, is still used all over the world for the study of chromosomes-plant, animal and human, and is considered internationally as the only comprehensive book catering to chromosome techniques for all organisms. Other noteworthy books published from this centre include Chromosome Techniques (Harwood, UK), Chromosome Painting (Kluwer Netherlands), Plant Cytogenetics and Chromosome Techniques-A Manual (Harwood Academic, UK), Chromosome in Evolution (CRC USA), and the 7 volume Plant Genome-Biodiversity and Evolution (Scientific Publishers, London).

Eminent visitors to the Centre include Professors JBS Haldane, PC Koller (UK), T Dobzhansky, S Patau, Hans Ris (USA), A Muntzing and Lima de Faria (Sweden), C Barigozzi (Italy), C Pavan (Brazil), W Gottschalk (Germany), VH Heywood, EC Cocking, EA Bevan (UK), Robert Haynes (Canada), Ralph Singleton (USA), H Kihara and Hu Han (China), Keith Jones (Kew, UK), and a host of others, including Sir Andrew and Lady Huxley (Ex-President, Royal Society, London).

One of the major achievements of the Centre in recent years is the opening of "MSc course in Genetics", a natural corollary of Chromosome Research, covering plant, animal and human systems. The course was initially run as a MSc Programme in Genetics, with the help of other departments of the Faculty of Life Sciences, has now been elevated to the status of an independent department.

The new wing on Bioinformatics, especially with reference to the establishment and maintenance of a Plant Chromosome Database is an added attraction of the Centre. This database, was first envisaged to digitise the wealth of plant chromosome data that was in the Centre, and now has been extended to include chromosome data from other centres too. It is now established as a BRIC (Bioresource Information Centre) under the IBIN (Indian Bioresource Information Network), funded by the Department of Biotechnology, Government of India.

The Development of Centre of Advanced Study

From April, 1972, the University Grants Commission granted this Department the status of a Selected Department for Special Assistance with reference to 'Chromosome Research' on the basis of the report of the Expert Committee of the UGC that visited the Department in 1970. The Committee recommended "the Department of Botany, Calcutta University may be provided special assistance by the UGC in order to help further strengthening of the existing school for chromosome research and related problems. The Committee is confident that with the assistance that may be provided, this Department will be able to grow to one of the well-recognised schools for chromosome research to serve the national needs".

The University Grants Commission, therefore, sanctioned 1 Professor, 1 Reader and 4 Lecturers for the purpose. From January 1973, the Centre on Chromosome Research started functioning, and all the posts have been filled up.

The Centre was selected for Indo-British University Collaboration Programme on Chromosome Research by the University Grants Commission and the British Council involved in long and short-term exchange of Scientists. In the exchange programme two lecturers viz. Dr. Sumitra Sen, Dr. P. Chatterjee and Dr. S. Roy, visited U.K. for a training in Ultrastructural studies and Protoplast Culture.

Research programme of the Centre of Advanced Study

I) Analysis of Chromosome Structure and its Components with the use of:

1) Special treatments and staining procedures.
2) Different chromosome banding techniques.
3) Quantitative photometry and flurometry.
4) Use of radioisotopes and other cytochemical techniques.

II) Chromosome in Evolution:

1) Chromosome study in Cryptogams to trace evolution.
2) Karyotype study in Phanerogams as an old in tracing evolutionary trends.
3) Study of population genetics in relation to environment.
4) Karyotype analysis in different economically important plant species, varieties etc.

III) Effect of Mutagens–Physical, Chemical and Environmental on Plant and Mammalian Cells both *in Vitro* and *in Vivo*:

1) Environmental and chemical as insecticides, heavy metals, pesticides, herbicides, natural and synthetic hormones alkylating agents, EES, EMS etc.
2) Physical agents as X-rays, ã-rays, UV-rays.
3) Setting up a unit of Genetic Toxicology.

IV) Chromosomes in Differentiation and Metabolism :

1) Chromosome studies from plant tissues in culture during growth and regeneration.
2) Chromosome study in differentiated tissues.
3) Biochemical and cytochemical studies during differentiation and morphogenesis.
4) Ultranstructural studies on cellular and chromosomal changes during growth and regeneration.

V) Chromosome in Relation to Human Diseases:

1) Use of leukocytes and fibroblast culture of human material both of normal and abnormal individuals.
2) Study of cancer chromosomes.
3) Use of different enzymes (LDH, MDH, etc.), hemoglobin and protein (Tf, Hp, Alb, total) patterns in the identification of polymorphism in human population.
4) Diagnosis of diseases including chromosome syndrome, myocardial infarction and cancer patients.
5) Scanning of mental defectives, pathological conditions of genetical incidence for heterozygote and familial inheritance pattern.

VI) Molecular Cytology of the Cell Nucleus:

1) Ultrastructural and chemical characterization of the nuclear bodies including the nucleolus, in relation to metabolism, differentiation and other cellular activities.
2) Cellular and biochemical changes during cell cycle.
3) Ultranstructural and biochemical studies on the mitotic events and their control.

VII) Estimation of Cellular DNA and its Characterization:

1) *In situ* and biochemical estimation of DNA.
2) Analysis of different types of repeat sequences at inter- and intraspecific level.
3) Functional significance in evolution and organogenesis.

VIII) Tissue Culture and Micropropagation:

1) For conservation of endangered species.
2) Propagation and widening of genetic spectrum in economically important plants.
3) Protoplast culture and cell fusion for genome manipulation.

IX) Cytological Survey of Eastern Himalayan Plants: Extensive work was done in this field during the sixties. The programme has been revived to make it more extensive and complete.

STAFF MEMBERS OF CAS (up to 1990)

A.K. Sharma, D.Sc., F.N.A., F.A.Sc.	—	INSA Golden Jubilee Professor & Programme Co-ordinator
Archana Sharma, Ph.D., D.Sc., F.N.A., F.A.Sc.	—	Professor and Deputy Programme Co-ordinator
Sumitra Sen, Ph.D., D.Sc.	—	Professor
S. Ghosh, Ph.D., D.Sc.	—	Professor
S.C. Roy, Ph.D.	—	Reader
P. Chatterjee, Ph.D.	—	Reader
A. Chatterjee, Ph.D.	—	Reader
R. Mallick, Ph.D.	—	Reader
G.C. Mitra, D.Phil., Ph.D. (Manchester)	—	Honorary Scientist

Supporting Staff :

M.L. De, M.Sc.	—	Electron Microscopist
P.G. Chatterjee, Ph.D.	—	Scientific Officer
C.K. Sur, Ph.D.	—	Scientific Officer

Staff Members in Associated Research Units :

A. Pharmacognosy Research Unit, Central Council for Ayurvedic and Siddha, Govt. of India

i) Dipali Dey, Ph.D. — Senior Research Officer
ii) M.N. Das, Ph.D. — Junior Research Officer
iii) S.N. Banerjee —. Technical Assistant

B. Medicinal Plants Unit, Govt. of West Bengal

P.K. Banerjee — Senior Research Assistant

Scientific Activities

A. K. Sharma

A) Karyotype Analysis, *in situ* DNA estimation and cytogenetic significance:

(1) Intraspecific nuclear DNA variation and seed coat colour in *Vicia faba*, *Phaseolus vulgaris* and *Cicer arietinum* :

(2) Family Bromeliaceae : Several species of this family studied like. These were (1) *Ananas comosus* var. quijoint, (2) *A. comosus* var. queen, (3) *A. comosus* var. kew, (4) *a. comosus* var. jhaldhup, (5) *A. comosus* var. 24 Parganas, (6) *Billbergia acqualis,* (7) *Bromelia* sp., (8) *Neoregelia* sp., (9) *Tillandsia* sp., (10) *Aechmea* – fosters favourite. *In situ* estimation of 4C DNA content indicate a range from 17.04 to 126.69 pg. The genus *Bromelia* showed a range of chromosome numbers with the normal number 2n = 32.

(3) Commelinanceae : 4 spp. of *Commelina*, 2 spp. of *Cyanotis*, 1 sp. Each of *Zebrina, Spironema, Rhoeo, Callicia* were being studied. Several varieties and cytotypes were also been investigated. In most of these species 4C DNA value exhibited a range, but a particular amount of nuclear DNA was found in maximum frequency. This phenomenon were correlated with the mixoploidy existing in somatic cells. C-DNA value is being correlated with the chromosome volume and length.

(4) Inter and intraspecific variability patternin in some Aroids : Three genera worked out with 8 ecotypes of *Colocasia esculenta*, shows no differences in chromosome but differ in their 4C DNA content. Analysis of repeated DNA and quantitative analysis of both acidic and basic protein content were also being carried out.

(5) Umbelliferae : Karyotype analysis and *in situ* DNA estimation was carried out in 7 varieties of *Foeniculum vulgare*, 3 varieties of *Coriandrum sativum*, 2 varieties of *Carum copticum*, 3 varieties of *Cuminum cyminum*, 2 varieties of *Daucus carota*, 2 varieties of *Anethum sowa*. They showed constancy both in chromosome number and DNA content level within a species.

(6) Nuclear DNA content estimated in 14 different species of *Acaca* as *A. nilotica, A. verek, A. salicina, A. bivenosa, A. Senegal, A. ligulata, A. neuraoyana, A. gerrardi, A. fernesiana, A. raddiana, A. suberosa, A. victoriae, A. leucophloea, A. tortillis*. Interspecific variation

in nuclear DNA was not very wide and the polyploid species did not show a very big difference in nuclear DNA content than those of diploid species. In general the fast growing perennial species had comparatively low DNA value than the slow growing species. The low C value in the obligate perennial acacias as well as in the polyploids may have contributed to their adaptation to stress conditions of the environment to which they are exposed. Both polyploidy and low DNA amount may have aided to the tolerance of *A. tortilis* to a wide range of extreme climatic conditions.

(7) Total ten species of *Acacia* with chromosome number ranging from $2n = 26$ to $2n = 104$ showed a minimum cell cycle time of 22 hrs to 29 hrs while their respective 4C DNA amount ranged from 5.58 to 6.7 pg. In general, species of *Acacia* with shorter cell cycle duration and lower chromosome volume showed less DNA amount than those species with a comparatively longer cell cycle time.

B) Study of Sex Determination in Plant Species Without Sex Chromosomes

The species investigated for sex determination were, karyological details were studied with special emphasis on sex determination with the help of improved methodology. *Tinospora cordifolia, T. tomentosa, Tiliacora racemosa, Staphania hernandifolia, Cocculus villosus* (Menispermaceae), *Cannabis sativa* (Cannabinaceae), *Putranjiva roxburghii* (Euphorbiaceae), *Trichosanthes dioica, Cephalandra indica* (with XY) (Cucurbitaceae). Except *Cephalandra indica* (0 – XY) none of them possess differential sex chromosomes. Nuclear DNA both in male and female plants are also being investigated. *Cephalandra* with a large Y chromosome has 9.04 arbitrary unit of DNA in males as compared to 7.16 in females.

C) Mutagenesis with Diffused Centromere and Regeneration in Culture

Six different species of *Luzuia* viz. *L. elegans, L. pediformis, L. nirea, L. luzuloides, L. campestris, L. pedemontana* with chromosome numbers ranging from 6-30 were subjected to *in vitro* culture. Chromosome analysis and DNA estimation revealed no marked change in DNA values *in vivo* even with high chromosome number confirming their origin through fragmentation. In callus the DNA value was found to be higher than normal, indicating the phenomena like, fragmentation, polyploidy and duplication of individual chromosome.

D) *In vitro* and *in vivo* Study of Some Medicinal and Other Plants

Several plants of medicinal importance as *Dioscorea floribunda, Kallstroemia pubescens, Cephalandra indica, Rauwolfia canescens* were investigated. It includes cytological studies of normal plants, callus tissue and regenerated plants, estimation of medicinal principles from normal plants, callus and regenerated plants. Irradiated callus tissues were also studied for induction of mutated regenerants.

In vitro cultures were made with *Crepis tectorum* and *Cipurai* palludosa. *Cipura* sp. was chosen for structural heterozygosity of chromosomes. Calli were induced from bulb scale explants also. Micropropagation of several imported species of banana was initiated and a number of regenerated plantlets developed and transferred to soil. The genetic stability of these plants were also tested.

Population wise differences of active principles with ref to the synthesis of diosgenin in *Costus specious* was also investigated. The duplication of chromosome set did not lead to increase in the content of active principles. The DNA content was further studied in callus cultures associated with the instability in chromosome number. The variation in abnormality with age corresponded with their DNA content.

The morphogenetic pattern in callus culture of *Dioscorea floribunda* was analysed along with steroid production. The synthesis of diosgenin showed differences in different cultural conditions. In developing calli, during shoot bud formation the synthesis of phytosterols and diosgenin showed an inverse relationship.

Archana Sharma in collaboration with Geeta Talukder

A) Genetic Risk Evaluation of MIC Cytogenetic Studies in Population Exposed at Bhopal

Cytogenetic damage in the methylisocyanate (MIC) gas exposed populations of Bhopal, India investigated. Frequencies of chromosomal abnormalities, sister chromatid exchanges (SCE), mitotic index and replicative index were screened following peripheral lymphocyte culture in 210 individuals.

The frequency of chromosomal aberration was in general higher in individuals from the exposed populations, the females showing a higher incidence. The frequencies of SCEs and depression of mitotic and replicative indices could not be related to the exposure or sex. The persistence of chromosomal abnormalities in the form of replicating minutes and exchange configurations over four years after the gas leak may indicate a residual effect on T-cell precursors.

B) Plants extract in Counteracting Cytotoxicity of Known Chemical Toxic Agents

Extracts of plant parts of different species of *Phyllanthus* were screened for their action against known clastogens and carcinogens both *in vivo* (*Mus musculus*) and *in vitro* (human lymphocyte culture). The anticlastogenic activity of leaf extract of *Phyllanthus niruri* and fruit extract of *P. emblica* was tested against a wide variety of known cytotoxic chemicals such as mitomycin C, cytophosphamide, pesticides (sumicidin, ethyl parathion), food coloring (metanil yellow) and slats of metals (Pb, Cd, Sn, Co, Al, Ce, Ba, Zn, Ni).

In vivo studies revealed that *Phyllanthus* extract significantly counteracted the induction of chromosomal aberrations, sister chromatid exchanges, micronuclei, sperm head abnormalities, histopathological disorders, brought about by the test chemicals.

The result indicates *Phyllanthus emblica* fruit extract was significantly more effective in protecting against clastogenicity induced by all the agents used including metals.

C) Genetical Effects of Environmental metal Pollutants on Living Systems

(i) *Modification of cytological effects of metals in higher organisms through metal – metal interaction*

In the aquatic plant *Vallisneria spiralis* L. the toxic effects of lower concentrations of lead could be antagonized by the essential metal iron. With higher concentrations of lead, the combination set showed additive effect. In *Allium cepa,* the highest dose of lead used in combination with iron showed synergistic effect with increase in chromosomal aberrations and decrease in mitotic index as compared to lead and iron single treatment sets. Different doses of nickel and copper sulphate given in equal (1:1) proportion to mice significantly decreased the clastogenecity of nickel when compared with the effects found after single metal treatment.

The human lymphocyte cells in culture showed antagonistic effects when mercury was added in combination with selenium in 2:1 proportion exhibiting significant decrease in the clastogenic effects as compared to the effects of mercury alone.

(ii) *Studies on cytotoxicity of cobalt in eukaryotic test systems*

The clastogenic activity of inorganic, non-carcinogenic cobaltous salts was studied on multiple test systems like *Allium cepa* and *Pisum sativum* as plant systems and *Mus musculus* as the animal system for *in vivo* tests and human lymphocyte culture as *in vitro* test system. The parameters included the study of mitotic index, chromosomal aberrations, sister chromatid exchanges, frequency of micronucleus formation and germ cell abnormalities. The programme also includes the modification of clastogenicity of $CoCl_2$ by dietary administration of ascorbic acid and extract of *phyllanthus emblica* to animals *in vivo.*

Cobalt chloride was found to be highly clastogenic and cytotoxic. The chromosomal abnormalities obtained were mainly chromosomal and chromatid breaks, gaps, centric fusion, polyploidy etc. *Phyllanthus* extract can modify significantly the clastogenic effect of cobalt salts. But ascorbic acid is relatively ineffective.

(iii) *Cytotoxicity of zirconium (Gr. IV) in in vivo and in vitro test systems*

The genotoxicity of the metal zirconium (belonging to group IVB of periodic table) is being assessed on multiple test systems, including *Pisum sativum* and *Mus musculus in vivo* and human lymphocyte culture *in vitro*. The parameters studied were mitotic frequency, chromosomal abnormalities and histopathological changes of different organs. Chromosomal abnormalities obtained were mainly chromatid and chromosomal breaks, gaps, ring chromosomes and centric fusions. In general, Zn, as oxychloride, is cytotoxic.

Similar effects were being worked out of cesium, beryllium, thallium, chromium, antimony and bismuth

D) Studies on Genetic Toxicology

A pilot study was carried out on selected populations in the industrial belt of West Bengal, exposed directly or indirectly to various industries. These populations were compared with non-exposed age matched controls from rural areas with respect to : (i) alterations in the frequencies of blood genetic markers identified through electrophoresis (1648 samples), (ii) alterations in frequencies of chromosomal aberrations and sister chromatid exchanges (437 samples) and (iii) incidence of congenital malformations in new born from hospital records (72, 167 births).

E) Genotoxic Effects of Tobacco on Plant, Animal and Human System

Since tobacco is known to be carcinogenic and mutagenic to the cells, investigation was undertaken to evaluate both wild and cultivated species of the genus *Nicotiana* available for genotixicity and mutagenicity. Indian tobacco contain high quantity of nicotin as compared to tobacco varieties of the western countries. To assess the role of nicotin for genotoxicity a comparative study had also been made between the species of *Nicotiana* with and without nicotin.

F) Study of Genetic Apparatus During Early Human Foetal Development

Cytogenetic studies were been carried out on couples, with a history of reproductive loss in the form of two or more abortions, still births or malformed children. Chromosomal abnormalities were seen in female patients and male patients.

From cytogenetic and sex chromatin studies in 35 cases with sterility or primary amenorrhea, 11% abnormalities were found.

Total protein pattern of the 136 cases plotted on a 10 cm scale, according to gestational age, showed 3 to 11 bands in early and 14 to 17 bands in late pregnancy.

G) Monitoring Human Populations for Genetic Effects Following Exposure to Industrialization

1) Genetic markers from human blood, like lipoprotein and haemoglobin, showed a significantly higher frequency of variant forms in populations from industrialized areas as compared to the non-industrialized ones. The expression of genetic markers not related to life style or other environmental factors was more or less similar in the different populations and could not be related to the degree of industrialization.
2) Cytogenetic parameters indicated the frequencies of chromosomal aberrations, micronuclei and sister chromatid exchanges were significantly higher in blood samples from individuals, exposed in industrial area, as compared to non-exposed control samples.

Sumitra Sen

A) Chromosome Analysis, *in situ* DNA Estimation and Differentiation in Certain Taxa of Fabaceae (Papilionaceae)

The first objective was to study the structure and behavior of chromosomes and *in situ* DNA cytophotometric analysis to gain an insight into an aspect of chromosomal control on differentiation.

The second objective was to analyse the chromosomal constitution of nodules as well as its DNA content. For fulfillment of the second objective it is expected to unravel the peculiar relationship of chromosomal constitution of nodules as applied by bacterial system.

A thorough chromosome survey has been made in different species of Fabaceae. Chromosome analysis has been carried out initially from root and shoot tips of *Crotolaria juncea, Trigonella foenum-graecum, Pisum sativum, Lathyrus sativus, Glycine max, Dolichos lablab, Phaseolus mungo* and *Phaseolus vulgaris*. The data have been compared with those from the embryo and endosperm. Endoreplication has been observed in suspensor cells of several species.

Cytophotometric estimation of DNA content in different organs of some of the species indicated that the differentiated regions of the root have higher DNA content per cell than that in meristematic regions. The endosperm and suspensor cells have more nuclear DNA than that of meristematic cells. It was further observed that cells belonging to inner cortex may contain 8C amount of DNA, while cells on the periphery and outer cortex are diploid with 4C amount of DNA in metaphase.

The root nodules form an important component in these legumes. The chromosomal control of the formation of legumes was also been undertaken. Two types of nodules are noted–elongated type and spherical type. The first type is found in *Lathyrus sativus, Pisum sativum, Crotolaria juncea, Trigonella foenum-graecum* and *Dolichos lablab*. Mostly tetraploid cells are found in these nodules. *In situ* estimation of DNA reveal the presence of cells with 8C DNA content, and a few cells with 4C DNA content. The spherical type of nodule can be seen in *Phaseolus vulgaris, P. mungo* and *Glycine max*. They have mostly dipoloid cells with 4C DNA content.

B) Studies on *in vitro* Culture of Some Economically Important and Endangered Plant Species

The work on chromosome analysis and *in vitro* propagation have been extensively done on *Urginea indica, Bowiea volubilis, Ruscus hypophyllum, Smilax zeylanica, Allium cepa, A. sativum, Scilla indica, Gloriosa superb, G. rothschildiana, G. lutea, G. carsoni, Lilium tigrinum, L. longiflorum, L. wallichianum, L. phillipinensis, L. nepalensis, Asparagus robustus, A. sprengeri, A. cooperi, A. officinalis, A. falcatus, A. pyramidalis, Smilax asparasoides, Kniphofia hybrid, K. aloides, K. nelson, K. uvaria, Ornithogallum virens, O. thyrsoides, O. umbellatum, Polygonatum oppositifolium, P. verticillatum, Cipura paludosa.*

(i) *Analysis of active chemical principle*

Phytochemical analysis is being carried out in different species of *Gloriosa* and *Asparagus*. Both qualitative and quantitative analysis in *in vivo* and *in vitro* are in progress. A correlated study of this analysis with the chromosome constitution and genotypic variability has also been undertaken.

C) Differential Radiosensitivity and Response to Growth Media of Diploid and Polyploid Varieties of Plants

The parameters of the study included (i) growth in artificial media and (ii) radiosensitivity.

Sibdas Ghosh and associates

A) Cytological and Biochemical Characterization of the Nuclear Matrix Network

Cytological and biochemical characterization of the nuclear matrix network from plant cells was first reported from this laboratory. The nuclear matrix network from *Allium cepa* was identified cytologically using different techniques as $AgNO_3$ staining, through pepsin digestion and subsequent staining with amido black and giemsa. Isolation technique of plant nuclear meteix was also standardized. Isolated nuclear matrix has been ultrastructurally characterized. Chemical composition of the isolated nuclear matrix had been worked out and the proteins were characterized through SDS PAGE. The identity of the nuclear matrix from animal, plant and lower eukaryotes has been established.

B) Organisation of Nuclear Bodies and Nucleoli

Using various cytological and ultrastructural techniques including autoradiography and *in situ* hybridization technique at the ultrastructural level, it has been possible to establish that active ribosomal cistrons with their primary transcripts forming the "Christmas tree" of Miller and Beatty (1969) are located in the dense nucleolar component (DNC), whereas the inactive ribosomal cistrons may be located in the fibrillar centres (FC) of the nucleoli. The organization of the secondary constriction of metaphase chromosomes and the condensation-decondensation cycle of the nucleolar chromatin has also been established.

It was established that DNA synthesis takes place in two phases in the nucleolus, once in the early S phase when ribosomal cistrons present in the DNC and FC replicate and then again in the late S-phase, when the nucleolus associated heterochromatin replicate. The cytochemical nature of the micropuffs have been studied in detail. It has been claimed that micropuffs represent centromeres in interphase plant cells.

C) Mitotic Events: Dissection and Characterisation

Using cell fusion techniques and with the help of autoradiography and ultrastructural studies it was established that several early mitotic events such as chromosome condensation, nuclear envelope breakdown, spindle formation are separate and independent events and should be controlled by distinct factors. It has been further claimed that sister chromatid separation may also be a separate event, which possibly depends on phosphatase activity. Evidences have been put forward to show that early mitotic events and the late mitotic events are controlled by separate chemical stimuli. It was also established that the centrosome cycle is independent of the chromosome cycle in the mitotic cycle.

Using synchronized plant cells we have demonstrated the independence of the growth cycle from the DNA-division cycle of the cells. The importance of protein synthesis in the initiation of mitosis has also been studied. The nature of these proteins are being investigated.

This project was part of an Indo-German Science collaboration programme with Prof. N. Paweletz of the German Cancer Research Centre, Heidelberg.

Satyesh Chandra Roy

Research work started from 1972 in the study of plant chromosomes of different families of angiosperms highlighting their importance in taxonomy, assessment of chromosomal aberrations in toxic chemicals, changes occurred during *in vitro* growth and differentiation and longitudinal differentiation of chromosomes using different banding techniques.

Established **Protoplast culture laboratory** in the department and regenerated plants and somatic hybrid from protoplasts and the importance of Protein profiles in understanding differentiation of plants under *in vitro*.

Worked on the **Micropropagation of medicinal plants** and the analysis and production of derivatives of secondary metabolites through somaclonal variation in tissue culture.

Worked on the to **Molecular mapping of many plants study Genetic diversity** for the characterization of cultivated plants and those plants that are difficult to identify through morphological characters.

Located High protein *Ama1* gene on the **chromosomes of *Amaranthus*** and also **located Insect resistant Lectin genes** on **the chromosomes of transgenic plants of Rice** through a special technique of C-PRINS using ***in situ* PCR.**

Isolated and sequenced new Ecotype-specific gene in *Amaranthus* that was **registered in Gene Bank No. DQ191177.**

Probir Chatterjee

A) Feulgen-Cytophotometric Determination of DNA in Characeae

(a) Genus : *Nitella*

Feulgen Cytophotometric DNA determination was done for five species of *Nitella* viz. *Nihyalina* var. and f. *hyaline* (n=18), *N. furcata* sub sp. *Furcata* var. and f. *furcata* (n=18), *N. stuartii* (n=15), *N. furcata* sub sp. *Flagelliformis* (n=9) and *N. acuminate* var. and f. *acuminate* (n=18). Together with the DNA content, the nuclear volume and the chromatin length of the species had also been calculated. A direct relationship among nuclear volume, chromatin length and DNA content was found. The highest DNA content was noted in case of *N. hyaline*, whereas the lowest content was found in *N. furcata* sub sp. *flagelliformis*.

(b) Genus : *Chara*

DNA content of seven taxa of the genus *Chara* were measured from Feulgen stained 2C nuclei (metaphase) of the antheridial filament cells using cytophotometric method. The DNA value obtained have been correlated with other cytological data like nuclear volume and chromatin length and from an analysis of these parameters a tentative phylogenetic scheme of evolution of these taxa has been presented. *C. coralline* (n=42) showed the highest DNA value corresponding to its high chromosome number, nuclear volume and chromatin length. *C. fibrosa* (n=42) because of its smaller chromosome size and nuclear volume has less DNA at metaphase. Among the four species with 28 chromosomes, *C. vulgaris* var. *inconexa* f. *hippelliana* (n=28) showed the lest 2C DNA corresponding to its smaller nuclear volume and chromatin length. The highest DNA value of 28 chromosomes species studied was recorded in *C. zeylanica* var. and f. *zeylanica* which also showed a positive correlation with nuclear volume and chromatin length.

(c) *DNA estimation in mitotic and amitotically dividing nuclei in species of Chara and Nitella*

The relative amount of DNA was measured by microspectrophotometric method from amitotically and mitotically dividing nuclei of twelve species of *Chara* and *Nitella*. The relative amount of DNA in amitotically dividing nucleus was significantly higher than that in mitotically dividing nuclei. Mitotic metaphase of reproductive structure showed 2C amount of DNA as the plant body was haploid, whereas the amitotic nuclei or vegetative nuclei of *Chara* and *Nitella* acquire a larger amount of DNA when dividing amitotically.

B) Study of Cytological and Spermicidal Effects of Algicides on the Green Alga Chara

(a) *Effect of Copper Sulphate*

Algicial effect of $CuSO_4$ had been studied on the mitotic cell division of spermatogenous filaments of *C. globularis* var. and f. *globularis* and *C. setosa* f. *setosa* which serve as a pest in water logged rice field soils in West Bengal. $CuSO_4$ at 1% conc. is highly toxic and lethal to both *Chara* species as well as to rice seedlings. $CuSO_4$ at 0.1% conc. is most effective in checking sperm production within 72 hr of treatment and this treatment is not deleterious either to germinated paddy seeds or to seedling growth. The initial inhibition of root growth of germinating rice seedlings caused by 0.1% $CuSO_4$ is reversed quickly within 48 to 72 hr of recovery.

Varied types of cytological abnormalities were induced in antheridial filaments with 0.1 and 0.25% solution within 72 hr of treatment. These include clumping, chromatid bridge at anaphase, helical shaped chromatin matters, micro-nuclear formation, early separation of chromosomes and budding out of nuclear matter.

(b) *Effect of Diurone*

Diurone was used in controlling the oospore formation of *Chara* species. Ten ppm solution of the chemical was found effective in controlling the sperm production in *Chara coralline* within 72 hr of treatment. Fifty ppm solution was toxic to *C. zeylanica* within 24 hr of treatment. The threshold concentration (10-15 ppm) obtained did not affect the germination and vegetative growth of the rice seedlings since the transient effect was quickly reversed within a short time.

C) Karyomorphology of Characeae and Determination of Chromosome number

A large number of taxa of *Chara* and *Nitella* occurring in West Bengal have been subjected to karyotype analysis and determination of TF%. Of these, two taxa of *Chara* viz. *C. vulgaris* var. *inconnexa* f. *hippelliana* and *Chara fibrosa* var. *fibrosa* f. *kukensis* were recorded for the first time in India and their chromosome number determined, the former having n=42, so also the latter taxon. A polyploidy race of *C. braunii* f. *braunni* showing n=28 and a chromosome number n=14 for *C. braunii* f. *perrottettii* were reported for the first time. A cytotype of *C. globularis* var. *leptosperma* f. *leptosperma* (n=14) was recorded in addition to the number n=28 recorded from West Bengal. In *Nitella stuartii* collected from Santiniketan, West Bengal a chromosome number count of n=18 was found instead of the previously reported number of n=15 from elsewhere in India.

D) Chromosome Banding in *Chara*

A banding technique for algal chromosome was reported for the first time. A schedule to differentiate longitudinal differention of chromosome in case of *C. braunii* f. *perrottettii* (n-14) was worked out. This was the first report of the localization of heterochromatic segments in algae by banding technique. The bands were revelaed using orcein. The banded regions probably possess repetitive DNA sequence which get reannealed faster and more completely than unique sequences and thus stains more intensely.

E) Gamma-ray Induced Morphological Changes in *Chara*

Gamma irradiation from Co60 source to *Chara zeylanica* var. and f. *seylanica* and *C. vulgaris* var. *inconnexa* f. *hippelliana* revealed morphological changes of diverse types such as increased calcification (including calcite deposits on reproductive structures), heavy epiphytic algal growth on the irradiated thallus, formation of giant cells, variation in cortex, stipulodes and branching patterns.

F) SEM Studies of Moss Spores

This work was carried out in four taxa of Pottiaceae viz. *Anoectangium stracheyanum, Hyophila involuta, Semibarbula orientalis* and *Barbula horricomis.* There seems to be some correlation in the progressive specialization of the spore morphology from *Anoectangium* to *Barbula* corresponding to the increasing complexity in the differentiation of the peristome teeth in these genera.

Amiyangshu Chatterjee

A) **Studies on Selected Fuelwood Species Through Cytogenetic and Cultering Techniques with a View to Their Improvement** (in collaboration with Dr. R. Mallick)

The studies included extensive investigations on fuelwood yielding plant species on the following aspects :

(a) *Survey and collection of germplasms of fuelwood species*

Germplasms of about 20 different species belonging to the genera *Acacia, Prosopis, Dalbergia, Derris, Gmelina, Leucaena, Grevillea, Sesbania, Cassia, Moringa, Pithocellobium* and others had been collected and maintained for further study.

(b) *Rapid multiplication of the elite plants through in vitro culture*

In vitro multiplication was done for 9 different fuelwood species.

(c) *Cytological study* was done for 12 different species.

(d) *Intra- and interspecific hydridization.*

B) Investigation on the Growth Behaviour and Biomass Yield of Selected Fast Growing Woody Species in Different Agroclimatic Zones

Growth behavior and biomass yield of a large number of fast growing fuelwood species in different agroclimatic zones of West Bengal such as Gangetic alluvial soil area, laterite soil area, Himalayan foot hills and coastal saline soil area.

C) **Mutagenic Studies on Different Plant Species and Comparative Analysis on the Effect of Mutagens on *in vivo* and *in vitro* Systems**

Both physical and chemical mutagens like gamma-rays, UV-rays and various alkylating agents had been applied on a number of plant species including *Leucaena leucocephala, Acacia nilotica, Prospois juliflora, Sesbania grandiflora, Corchorus olitorius* and *Vicia faba*. The effects were studied with respect to growth, morphology, maturity and other characteris through successive generations. The promising mutant plants were selected for understanding the nature of gene mutation and possibility of utilization of the mutant lines in breeding for improvement of the species.

Mutagens were also applied in different doses on seeds, explants and regenerating calli. Comparative study of the effects of mutagens on *in vivo* and *in vitro* systems were done on seed germinations, frequency of regeneration in *in vitro* condition, rate of survival, frequency of abnormal plants and other appropriate characters. Promising results obtained indicating a certain limit of doses to intensity the effects in both the systems.

D) **Karyomorphological and Biochemical Studies of Some Leguminous Taxa and *in vitro* Responses of Some Hardwood Species**

In view of multipurpose uses of majority of the leguminous species we have been a number of leguminous species belonging to different genera such as *Acacia, Prosopis, Pithocellobium* and others were investigated in following aspects:

(a) Since seed germination is an inherent problem in many woody species. Seed germination was studied involving application of different physical and chemical reagents for enhancement of seed germination rates. Promising result has already been achieved in some cases.

(b) Detailed karyomorphological investigation in all these species were being conducted in order to understand the chromosomal status, existence of cytotypes, polyploids and their significance in relation to ecological distribution of the plants.

(c) Seed protein analysis of the leguminous species through gel electrophoresis technique in order to evaluate minor differences if any between biotypes, cytotypes, ecotypes and others.

(d) Micromorphological Study with respect to stomata and epidermal cells and scanning electron microscopic study of the seed coat morphology.

(e) *In vitro* responses for micropropagation of wood plants.

E) Study on Polyploidy

Polyploids induced in a variety of plants like *Sesbania grandiflora, Corchorus capsularis, Cicer arietinum, Pisum sativum* and others with chemical treatment. Cytomorphological behavior, growth rates and fertility of these plants were studied.

F) Cytogenetical Investigation of Yeast

Yeast (*Saccharomyces cerevisiae*) cells were exposed to different physical and chemical agents followed by their growth in complete media. Comparative assessment of the mutagenicity of these agents were recorded by detection and assessment of the frequency of mutations after allowing the treated population of yeast cells in minimal media.

Ranjit Mallick

A) Studies on Selected Fuelwood Species Through Cytogenetic and Culturing Techniques with a View to Their Improvement

(In Collaboration with Dr. A. Chatterjee)

B) Successful Biotechnological Approach to *in vitro* Regeneration and Multiplication of *Sasbania* including –

(i) Detailed karyomorphological studies.

(ii) Tissue culture techniques for callus induction.

(iii) Cytological and analysis of the *in vitro* regenerated plants including meiotic behavior and karyotype studies, protein pattern analysis of regenerated shoots as well as seeds.

C) Improvement of Common Species Through Gamma Radiation

Application of gamma radiation on the seeds of *Coriandrum sativum* and *Foeniculum vulgare* and isolation of variants had been carried out in M_{1}., M_2 and M_3 generations of the dwarf mutants of *C. sativum* and tall mutant of *F. vulgare*. The dwarf mutant of coriander produced significant foliage and seeds per umbel, whereas tall plant produced more seeds in each umbel. The protein quantity and quality also differed from that of the control plants. The newly obtained plants had shorter flowering period, early flowering time and minor structural variation of chromosomes.

D) Analysis of Storage Proteins from Seeds of Different Umbellifers by SDS-PAGE Techniques.

G.C. Mitra

A) Integrated Research cum Plantation Programme of *Eucalyptus* spp. and *Citrus* sp. Based on Tissue Culture technique

Success achieved in regenerating multiple shoot buds directly from the cultured shoot segments of *Eucalyptus terreticornis* and *E. citridiodora* of Forest Dept., Midnapur and in producing nuclear tissue of *Citrus sinensis* var. *mosumbi* (elite plants selected from *Citrus* orchard at Taldangra, Bankura, Govt. of West Bengal). A few regenerated plants also transferred to potted soil for hardening and further growth.

B) Morphogenetic Studies in *Corchorus* spp.

Multiple shoots regenerated directly from cultured shoot segments of *Corchorus capsularis*. Rooting induced in the regenerated excised shoots grown in rooting medium. Morphogenetic studies including some clonal variations were also studied.

New Objectives for CAS (2005)

New objectives set forth by review committee vide UGC letter no. F5-3/2004(SAP-II) dated March, 2005.

1. To assess the diversity in plant chromosome structure and organization using cytogenetical and molecular tools.
2. To: (a) understand the instability of genomes in *in vitro* cultures of cells, tissues and organs; (b) develop stable clones; (c) augment *in vitro* production of products of commercial value using tissue culture and genetic transformation studies.
3. To prepare chromosome database for Indian Plants.
4. To develop protocols/diagnostic kits for assessing genotoxicity of chemicals disposed in the environment through natural and anthropogenically mediated processes; and
5. To understand role of the chromosomal diversity in plant evolution and conservation biology.

Presently the 6th Phase of CAS is running successfully involving all faculty members of the Department with the leadership of Prof. Sumita Jha as Program Co-ordinator since 2010. This is the only Department of the University achieved this prestigious status. The ongoing Thrust Area is ‘Plant Genomics and Integrative Biology’, with the Board Areas of Research as follows:

1. Plant Genomics
2. Genotoxicity and Stress Biology
3. Taxonomy, Phylogeny and Bioprospecting
4. Integrative Biology

Beside this DST-FEAST 2nd Phase, UGC UPE program and DST PURSE program also enriched the Department. At present our department ranked 2nd position among all the departments of the University, based on scientific output and research publications as per annual report of CU 2014.

EMINENT TEACHERS OF CYTOGENETICS

Prof. Arun Kumar Sharma

Prof. AK Sharma is an internationally acclaimed Cytogeneticist and Cytotaxonomist, and one of the most distinguished plant scientists of our country. He is a distinguished alumnus and faculty of the Department of Botany, University of Calcutta. Besides his own research activities, he has significantly contributed to the policy, planning and formulation of scientific and technical programmes for the growth of Science in India in general, and various domains of Plant Sciences in particular in its totality.

Born to Charu Chandra Sharma and Shovamoyee Sharma, on 31st December 1924 in Calcutta, Prof. Sharma had his early education at Mitra Institution Bhowanipur (1933-39). He also studied at Asutosh College (1939-41), Kolkata and obtained B.Sc. (1941-43), M.Sc. (1943-45) and DSc (1955) from the University of Calcutta. He began his professional career as Faculty in Botany at the University of Calcutta, first as Asst. Lecturer (1948) and subsequently continuing to work as Lecturer, Reader and Professor at the Department of Botany, University of Calcutta (1948-1988). He was appointed Sir Rashbehari Ghosh Professor and Head of the Department of Botany in 1969. Prof. Sharma initiated studies on chromosome research and built up an active school of Cytogenetics and Cytochemistry to conduct researches on different problems of plant and human genetics. Over 60 PhD and 10 DSc students have obtained their degrees under his guidance. He has authored over 600 research papers, including 06 in *Nature*, several papers in *Chromosoma*, *Naturwissenschaften*, and host of top notch specialized journals, and contributed invited reviews / articles to *Botanical Review*, *Chromosomes Today*, *The Cell Nucleus*, *International Review of Cytology*, *Encyclopedia of Microtechniques*, *Biology International*, and others. In recognition of his outstanding contributions he was accorded Jawaharlal Nehru Fellow and National Lecturer of UGC (1972-76), and later as the Golden Jubilee Professor of the Indian National Science Academy from 1985-1990 at the University of Calcutta. Prof. Sharma is till date an intrinsic part of the Department of Botany, and is actively involved in the various academic activities of the Department.

Contribution to Teaching

An exceptional teacher, Prof. AK Sharma has taught students at the Department of Botany since 1947, several disciplines, including Algae, Bryophyte, Palaeobotany, apart from Cytology, Genetics, Molecular Biology, etc.

Contributions in the service of Science in India

Professor Sharma is involved in various domains of scientific and technological programmes and scientific planning of the country. He believes in prioritizing researches, and advocates for supporting a competent investigator and a viable and innovative project at all costs.

Amongst the various positions held by him from time to time in numerous committees mention may be made of Chairmanship of the Biological Research Committee of CSIR, Biology Panel of UGC, Membership of the Science and Engineering Research Council of of DST, and Governing Bodies of CSIR and ICMR. Further, he has served as Chairman, Indian National Committee of IUBS-INSA (1978), Man and Biosphere Committee, Department of Environment (1981-89), FASAS Commission on Science and Technology for Development in Asia (1990), Chairman, Biological Sciences Fellowship Committee of The Third World Academy of Sciences (TWAS), Trieste (1991-1998), Co-chairman, Global Continuing Committee on Role of Scientific and Engineering Societies in Development (AAAS-INSA-ISCA) (1980), Birla Industrial and Technological Museum, Kolkata (1990-98), Plant Biotechnology Committee, DBT (1997-), Chairman, Steering Committee, National Bioresource Development Board, Government of India (2000-todate), Plant Science Research Committee, CSIR (1998-2004); and Member, Executive Committee, IUBS, Paris (1982-85), IUBS Steering Committee on Biological Monitoring of the State of Environment (1983), and Board of Trustees, International Foundation for Science, Stockholm (1984-87). He had served as the Chairman of Research Councils of the Birbal Sahni Institute of Palaeobotany, Lucknow, National Botanical Research Institute, Lucknow and Central Institute of Medicinal and Aromatic Plants, Lucknow, National Institute of Plant Genome Research, New Delhi.

Prof. Sharma founded the international journal of cytology and allied topics "*The Nucleus*" in 1958, at young age of 34, and has authored (jointly with Archana Sharma) the classic reference book "*Chromosome Techniques: Theory and Practice*" in 1965, published by Buttorworth, London–this book is extensively followed in the chromosome labs world over. Whereas, *The Nucleus* is running in the 57th year of its publication and is published by Springer, and the latter went into 2nd and 3rd editions published in 1972, 1980. In addition to the Chief Editor of the journal *The Nucleus*, he has served on the Editorial boards of many journals including *Cytologia*, *Proceedings of the Indian National Science Academy, Journal of Cytology and Genetics, Proceedings of the Indian Academy of Sciences and Indian Journal of Experimental Biology.*

Awards and Honours

Professor Sharma has received wide international recognition for his contributions on Cytogenetics, Cytochemistry and Cell Biology, as also for his services to the cause of Science and

Society. He has served as the President of the Indian National Science Academy, New Delhi (1983-84), National Academy of Sciences India (2010-12), Federation of Asian Scientific Academies and Societies (1984-89) (Founder President); and was conferred with the Civilian honour the Padmabhushan (1983) by the Government of India.

He was conferred the SS Bhatnagar Prize (1976), Jawaharlal Nehru Fellowship (1972), Paul Bruhl Memorial Medal by the Asiatic Society (1972), Birbal Sahni Medal by the Indian Botanical Society (1974), First JC Bose Award by UGC (1976), Silver Jubilee Medal by INSA (1976), UGC National Lecturership (1977), FICCI Award (1979), Golden Jubilee Professorship by INSA (1985-90), OP Bhasin Foundation Award in Biotechnology (1993), GM Modi Award in Biotechnology (1994), MN Saha Medal by INSA (1998), VASVIK Award (2003), Eminent Teacher of Distinction by the University of Calcutta (2006), Rathindra Puraskar by Visva Bharati (2008), Life Time Achievement Award by the Indian Botanical Society (2010). He was elected as the President of the Plant Science Section (1973) and General President of the Indian Science Congress Association (1981), Indian Society of Cytologists and Geneticists (1976-78), Botanical Society of Bengal (1977-79), Genetic Association of India, Society of Cell Biology (1979-80), Indian Botanical Society (1980), Vice-President, The Asiatic Society (1997), President, Indian Association for the Cultivation of Science (1997-todate), and elected Fellow of the Indian National Science Academy, New Delhi, Indian Academy of Sciences, Bangalore, National Academy of Sciences (India), Allahabad, National Academy of Agricultural Sciences, New Delhi, and The World Academy of Sciences (TWAS), Trieste (Italy).

Visits Abroad for Image Building of Indian Science and Interaction with Professional Community

He was invited to act as either Chairman of different sessions or panel specialist in the International Scientific meetings, namely Chairman of the section on Chemical Mutagens at the International Congress of Genetics at Montreal (1958), Tokyo (1968), Leader of the Indian delegation to the International Congress of Genetics at the Hague (1963), International Congress of Cell Biology at Berlin (1980), Chairman of the section Newer Concepts of Structural Organization of Chromosomes, New Delhi (1983). He attended the International Congress of Cyto and Histochemistry at Frankfurt (1964) as Panel Expert, invited speaker at the Oxford Chromosome Conferences (1967, 1970, 1977), International Botanical Conference at Seattle (1969), Tropical Botanical Conference at Denmark (1978), visited Norway as official delegate to the IUBS General Assembly (1973), UNCSTD conference at Vienna (1978). He had been to Washington in 1980 as the Chairman of the Joint Organizing Committee of the Global Seminar on the Role of Scientific Societies in Development, jointly organized by the American Association for the Advancement of Science, Indian Science Congress Association and Indian National Science Academy, the final conference being held in Delhi on December 1-5, 1980, in which about 50 countries were represented. As President of Indian National Science Academy and later as Founding President, FASAS, VISITED A Number of Academies in different countries of Asia, Europe and USA, on invitation for giving lectures (1995-1999).

Prof. Archana Sharma

A leading cytogeneticist and cytotoxicologist, Late Prof. Archana Sharma, was a faculty of the Department of Botany, University of Calcutta.

Prof. Sharma was born on 16th February, 1932, in Pune, to a family of academicians. She completed her early education in Rajasthan, and after completing her B.Sc. from Bikaner, joined the Department of Botany, University of Calcutta, for her M.Sc. (1951), and subsequently was awarded Ph.D. (1955) and D.Sc. (1960). Prof. Sharma was a brilliant student and was only the second woman to be awarded the D.Sc. degree at the University of Calcutta. She joined the Department of Botany as a faculty in 1967, and became Professor of Genetics in 1972, in the Centre of Advanced Studies in Cell and Chromosome Research, and the Head of the Department in 1980. She was active till her last days, and breathed her last on the 14th of January, 2008.

Professor Archana Sharma was a remarkable and passionate teacher, and is remembered by her students as an exceptional teacher of Genetics. Her students remember her for her amazing wit and sterling personality, along with her academic prowess.

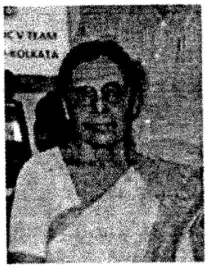
A dedicated researcher, Prof. Sharma is remembered for her contributions in developing novel staining and pre-treatment techniques that are used all over the world. One of her landmark findings, that was published in a series of highly acclaimed journals including Nature, was that of a new concept of speciation and fixity of chromosome numbers in obligate vegetatively reproducing plants. Using extensive studies on monocot cytology, Prof. Sharma showed that inconsistency of chromosomal complements was of frequent occurrence, and that new shoots arising from such cells give rise to new cytotypes/genotypes/cryptic species among such vegetatively propagated plants. Her other major contributions include induction of division in adult and causing polyteny in differentiated plant tissues and cytotaxonomic investigations of flowering plants. Her investigations in the fiels of human genetics and toxicology included the assessment of chromosomal and genetic polymorphisms in eastern Indian populations and their comparison with pathological cases, study of differentiated patterns of human fibroblasts in relation to polyteny, genetic polymorphisms in relation to environmental agents on living systems, clastogenic and mutagenic effects of various pesticides and metals on multiple test systems, assessment of genotoxic and clastogenic activity of environmental agents in sub-toxic doses in exposed populations in relation to different modifying factors, like, diet, genetic predisposition, drugs, etc., and the use of dietary factors and plant products in modulating cytotoxicity of known metal pollutants and pesticides.

Prof. Archana Sharma trained a large number of reaserchers, and supervised around 50 Ph.D. theses, and published over 300 research papers. She has authored eight internationally acclaimed books and was the Editor of The Nucleus till her demise. He was actively involved with several policy making bodies which included, Science and Engineering Research Council

(DST), Environmental Research Council (Ministry of Environment and Forest, GOI), Panel for Co-operation with UNESCO, HRD Ministry, GOI, and technical committees of various agencies like, DBT, DST, CSIR, etc.

Prof. Archana Sharma was an exceptional scientist and her scientific acievements were acknowledged by various governmental agencies and scientific communities. She was conferred memberships of the Indian National Science Academy (INSA), the Indian Academy of Sciences, and the National Academy of Sciences India. Several other awards like, the President of the Indian Botanical Society (1989) and the Biological section of the National Academy of Sciences India; General President, Indian Science Congress (1986-87); Member, International Academy of Science (Germany 1990); Member INSA Council (1980-82). Professor Archana Sharma was awarded the SS Bhatnagar Award by CSIR (1976), the JC Bose Award (1974), the UGC National Lecturer (1990), the FICCI Award (1983), the Birbal Sahni Medal by the Indian Botanical Society (1984), the Platinum Jubilee Lecture (1989) and the Ashutosh Mukherji Medal (1999) by the Indian Science Congress Association, and the coveted Padma Bhushan Award by the Government of India (1984).

Prof. Sumitra Sen



Matriculation – Sir Romesh Mitra Girls' high School
I.Sc. – Asutosh College
B.Sc. – Presidency College
M.Sc. – University College of Science, Department of Botany
Ph.D. – Presidency College under Prof. P.N. Bhaduri
D.Sc. – University College of Science, Department of Botany

Programme Coordinator and Head, Department of Botany, University of Calcutta.

Research Specialization

- Cytological and embryological studies in Nympheaceae
- Extensive Review of chromosomes of Liliales involving evolution and study of genetic diversity
- *In situ* estimation of DNA through cytophotometry.
- Basic studies on chromosomes of differentiated tissue, polyfenenuclei and endosperm tissue.
- Joined in the post of Reader at Centre of Advanced Study, Department of Botany and subsequently became Professor and Programme Co-ordinator (Centre of Advanced Study) and later Head of the Department.

Research Programme

Chromosome study (i) in relation to differentiation and (ii) *in situ* DNA estimation in different taxa of Liliaceae.

After retirement, continued her work in the Department as **UGC Emeritus Fellow**.

Guided Ph.D. Programme of Students—

The following students worked with her on different aspects chromosome study *in vivo* and *in vitro* and awarded Ph.D. degree :

Yogendra K. Bansal, Sumita Jha, Shyamaprosad Chakroborty, Dipak K. Kar, Kakoli Kar, Bipasha Chakroborty, Sanghamitra Nayak, Biswajit Ghosh, Kana Talukder, Sundeep Pryadarshi, Debjani Chaudhuri, Aparna Rani Basu.

Visit abroad

- Under Indo-British University exchange programme visited Queen Mary College, University of London. There learnt to work in CORINTH model of electron microscope which we had in our department.
- Visited Nottingham University.
- In Indo-USSR Research Collaboration programme had been to Moscow and Novosibirsk.
- Member of HRD Committee – CSIR.
- Member of UGC Committee to visit different University for evaluation.
- Fellow of National Academy of Science India.
- Council member of Indian Science Congress.

Prof. Satyesh Chandra Roy

Date of Birth : 9th January, 1941

Address : 31, Baikuntha Saha Road, Santoshpur, Kolkata-700075

E-mail : scroyind@yahoo.com, Mobile : 9831858955

Academic Qualifications : School Final 1956; B.Sc. (Hons.) in Presidency College 1961; M.Sc. in Calcutta University College of Science, 1963.

Ph.D. in the University of Calcutta under Professor A.K. Sharma in 1970

Fellow of the West Bengal Academy of Science & Technology (F.A.Sc. & T.) in 1994

Teaching and Administrative Experience :

- Joined as a **Lecturer in Botany** in Tamralipta Mahavidyalaya (Tamluk College) from 1970 to 1972.
- Joined as a **Lecturer in Botany** in the Centre of Advanced Study for Cell & Chromosome Research (Special Assistance Programme) in December 1972.
- Selected as a **Reader in Botany** in the CAS, in 1984.
- Selected as a **Professor of Botany** in 1994.
- Elected as a **Member of the Senate**, Calcutta University in the Professor Constituency from 1995 to 2000.

- Acted as a **Co-ordinator** in the Centre of Advanced Study for Cell and Chromosome Research in Botany from 1997 to March, 2003.
- Acted as a **Convenor in Ph.D. Committee** in Botany from 1997 to 2001.
- **Emeritus Professor** from the University Grants Commission, New Delhi from 2006 to 2009.
- Selected from the University Grants Commission as **Visiting Professor** in the **University of Burdwan** in 2010 for three months.
- **Guest Faculty** in the Post graduate Department of Botany, Scottish Church College, Calcutta.
- **Guest Faculty** in the Ramakrishna Mission Vivekananda Centenary College, Rahara.

Other Assignments :

- Worked in the **Protoplast Culture Laboratory of Professor EC Cocking, University of Nottingham** under Indo-British University Collaboration Programme in 1975 and 1978 (Three months in each programme).
- Worked in the **Genetic Engineering Laboratory of Professor EA Bevan in the University of London and in the laboratory of Dr. CG Vosa in the University of Oxford** under IBUC Programme in 1985 and 1987 (Three months in each programme).
- Worked in the **Cell Biology Laboratory of Professor Pawelez in the German Cancer Research Centre in Heidelberg** in 1994 for three months.

Prof. Ranajit Mallick

Date of Birth : May, 1934

Academic Record :

a) Passed M.Sc. Examination in Botany in 1959 with specialisation in Cytogenetics from C.U.
b) Joined the Cytogenetics Laboratory, Dept. of Botany, C.U. as Pre-Doc. Fellow under Prof. A.K. Sharma in 1960
c) Obtained Ph.D. degree in Botany in 1964 from C.U. under the guidance of Prof. A.K. Sharma
d) Joined as Lecturer in Botany, Surendra Nath College in 1962
e) Joined the Botanical Survey of India as Botanist in 1965
f) Joined as Lecturer at the Centre of Advanced Study, Dept. of Botany, C.U. in 1978
g) Retired on Prof. Botany, C.U. in 1999.

Academic Achievements :

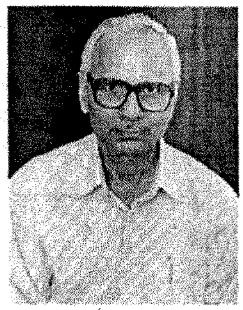
a) Visited the Queen Marry College University of London in 1983 and 1986 as Research Fellow under UGC–British Council Exchange Programme.

b) The following students have obtained their Ph.D. degree in Botany from University of Calcutta under my guidance: i) Molly Datta, ii) Anath Bandhu Das, iii) Rabindra Nath Sinha, iv) Madhuparna Datta, v) Smritish Bandopadhaya, vi) Sangita Pal (joint investigator).

Prof. Amiyangshu Chatterjee

Date of Birth : January, 1941

Academic Qualifications : Graduate from the Presidency College, Kolkata in 1961 and did his Post graduation from University College of Science, Calcutta in 1963. Then he joined as Research Fellow under Professor Arun Kumar Sharma on 1964 and continued till 1970 and obtained his Ph.D. in 1970 from University of Calcutta.



His title of thesis was "Cytotaxonomical Studies on certain taxa with special reference to Geranialies".

He joined at Jute Agricultural Research Institute (ICAR) in 1971 and placed at ICAR Research Complex for North-Eastern Hill Regions at Shillong (Meghalaya) as Geneticist (Floriculture) in 1973 and acted as Guest faculty in School of Life Sciences in the North-Eastern Hill University at Shillong.

Then he joined the University of Calcutta as faculty on 4th March, 1978 and retired as Professor of Botany w.e.f. 1st January, 2006.

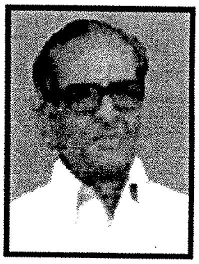
At present engaged in teaching in post graduate department of Microbiology, Botany and Pharmaceutical Engineering in several Institutions as guest faculty.

Ph.D. students : Dr. Bandana Bandyapadhyay, Dr. Maitreyee Banerjee, Dr. Nabarun Ghosh, Dr. Ashish Kumar Nandy, Dr. Paritosh Kumar Ghosh,Dr. Anath Bandhu Das, Dr. Rabin Prasad Sardar, Dr. Balaram Jana.

OTHER EMINENT TEACHERS OF CYTOGENETICS

Prof. Smritimoy Bose
Served as successful teacher in Genetics.

Prof. G.C. Mitra
Professor of Plant Biotechnology and Tissue culture.



Prof. Subrata Sen
Professor of Biostatistics

PHYTOCHEMISTRY AND PHARMACOGNOSY

Pharmaco-anatomy Laboratory was established by Prof. Praphulla Chandra Datta who joined the department in the year 1960 as a Lecturer in Botany. Since then he worked in different fields of pharmacognosy, tissue culture, cytology and anatomy. He worked on both fundamental aspects and applied aspects. Fundamental research included,

i) Solutions of controversies on taxonomy and phylogenetic relations of taxa through a combined study of cytological and anatomical aspects in *Rumex* (Polygonaceae), *Lathyrus* (Papilionaceae), *Justicea* (Açanthaceae), Caligeae, *Phaseolus* (Papilionaceae), *Durio,* Dracenaceae, *Carica*, Convolvulaceae, *Eclipta, Centella, Brassica,* Piperales, *Vites*, Scrophulariaceae, *Dalbergea*, Meliaceae etc.;

ii) Application of petal venation in taxonomy;

iii) Growth, development and differentiation; their controlling factors, environmental, genetical and biochemical study involving both ontogeny and experimental observations;

iv) Ontogenetic studies revealing some new aspects and verifying some questions regarding the development of leaf fibres of *Agave*, phloem fibres of *Ipomoea*, androgynophore development of *Cleome,* embryo development in *Hibiscus*;

v) Tracing relationship between the chromosomal changes in cells and differentiation of tissues and organs in species of *Coriandrum, Lathyrus, Agave, Vigna, Dracaena*;

vi) Reinterpretation of shoot apical development in Dracaena, *Boehmeria, Piper, Datura* etc.;

vii) Effect of seasonal changes, compression (centripetal, centrifugal or bidirectional) on the secondary xylem studied critically to solve the long discussed problem of differentiation;

viii) Role of hormones, pH, sugar level on the differentiation of cell types in vitro;

ix) Differentiation of bark elements by hormones in *Plumeria, Adhatodha.*

Applied Aspects Included,

i) Quality control of crude drugs

ii) Improvement of active compound of drugs (Cell, tissue and organ culture),

iii) Biotransformation of compounds for more useful compounds (Cell, tissue and organ culture),

iv) Production of new genetic lines of medicinal plants (Cell, tissue and organ culture).

Prof. P.C. Datta introduced the special paper Experimental Pharmacognosy in the 1970s. He was involved in teaching the subject till 1992. Prof. Bratati De, after joining the department in the year 1990, continued to teach the subject in the special paper. Since 2002, the subject is being taught as Phytochemistry and Pharmacognosy. The subject Phytochemistry and Pharmacognosy was introduced as a general paper in Botany in the year 2002.

EMINENT TEACHER

Prof. Praphulla Chandra Datta (1927-1999)

Education :

B.Sc. (University of Calcutta, 1947)

M.Sc. (University of Calcutta, 1950)

Ph.D. (University of Calcutta, 1958)

Research and Teaching Posts held :

Research Assistant (1951-1953) : Maize and Paddy Research Station, Kalimpong

Lecturer (1953-1960) : Chandernagore Government College

Lecturer (1960-1970) : Department of Botany, University of Calcutta

Reader (1970-1979) : Department of Botany, University of Calcutta

Professor (1979-1992) : Department of Botany, University of Calcutta

Awards and achievements :

1. UNDP Fellowship awarded by UNESCO [1972 (September)–1973 (May): visited University of Leicester (Laboratory of Prof. H.E. Street), John Inn's Laboratory, Norwich (Laboratory of Dr. N. Sunderland), University of Cambridge (Tissue culture laboratory of Dr. D.N. Butcher), Jodrell Laboratory of Kew Garden, London (Wood Anatomy Laboratory of Dr. Metcalfe), University of Wales (Tissue Culture laboratory of Prof. H. Rees), Tissue Culture Brook Haven National Laboratory, UPTON, USA (Tissue Culture Laboratory of Dr. Peter S. Carlson and Laboratory of Dr. Graeme P. Berlyn of School of Forestry), Yale University (Tissue Culture Laboratory of Prof. I.M. Sussex), Harvard University, Lake Placid, USA (Tissue Culture Laboratory of Dr. Dougall), Michigan State University (East Lansing) (Tissue Culture Laboratory of Prof. H.H. Murakishi, Cytological Laboratory of Dr. William Tai and Anatomy Laboratory of Dr. I.W. Knobloch), University of Wisconsin (Tissue Culture Laboratory of Prof. F. Skoog, Dr. A.C. Hildebrandt and Anatomy Laboratory of Dr. R.F. Evert), Minnesota State University (Pharmacognosy and Tissue Culture Laboratory of Prof. E.J. Staba).
2. Senior Vice President of SIVEAST CONSULTANTS INC. Dover, Delaware, USA.

Membership of Learned Societies :

International Association of Wood Anatomy, USA.

International Society of Medicinal and Aromatic Plants.

Indian Science Congress Association

Society for Advancement of Botany

National Botanical Society

Research Interests :

1948-1950 : Cytogenetics of *Rumex, Lathyrus* and *Verbena* (for M.Sc. Thesis).

1951-1953 : Plant breeding, selection etc. of paddy, pulses, wheat and fodders (as Paddy Research Assistant in Agric. Dept. of Govt. of West Bengal)

1953-1958 : Cytogenetics and cytotaxonomy of *Ipomoea, Dracaena, Lathyrus, Coriandrum* etc.

1958-1961 : Flora of Hooghly district (West Bengal).

1961-1972 : Weed flora and weed control; floral biology; karyological anatomy; karyological, anatomical and chemical taxonomy of economically important taxa; staining technique; fibre botany; pharmacognosy; cytohistomorphogenesis.

1972-1999 : Tissue culture in relation to experimental pharmacognosy and experimental anatomy on *Datura, Vinca, Thevetia, Atropa, Mentha, Plumeria, Adhatodha, Strychnos, Azadirachta, Dioscorea, Tectona, Ervatamia.*

Wood anatomy of Meliaceae and Annonaceae

Pharmacognosy of bark, leaf and seed drugs

Experiments on xylogenesis and phloem differentiation.

Research Contributions :

A. *Fundamental aspects*

Solutions of controversies on taxonomy and phylogenetic relations of taxa through a combined study of cytological and anatomical aspects in *Rumex* (Polygonaceae), *Lathyrus* (Papilionaceae), *Justicea* (Acanthaceae), Caligeae, *Phaseolus* (Papilionaceae), *Durio,* Dracenaceae, *Carica*, Convolvulaceae, *Eclipta, Centella, Brassica,* Piperales, *Vites*, Scrophulariaceae, *Dalbergea*, Meliaceae etc.

Application of petal venation in taxonomy.

Growth, development and differentiation; their controlling factors, environmental, genetical and biochemical study involving both ontogeny and experimental observations.

Ontogenetic studies revealing some new aspects and verifying some questions regarding the development of leaf fibres of *Agave*, phloem fibres of *Ipomoea*, androgynophore development of *Cleome,* embryo development in *Hibiscus.*

Tracing relationship between the chromosomal changes in cells and differentiation of tissues and organs in species of *Coriandrum, Lathyrus, Agave, Vigna, Dracaena.*

Reinterpretation of shoot apical development in Dracaena, *Boehmeria, Piper, Datura* etc.

Effect of seasonal changes, compression (centripetal, centrifugal or bidirectional) on the secondary xylem studied critically to solve the long discussed problem of differentiation.

Role of hormones, pH, sugar level on the differentiation of cell types in vitro.

Differentiation of bark elements by hormones in *Plumeria, Adhatodha.*

B. *Applied aspects*

Quality control of crude drugs

Improvement of active compound of drugs (Cell, tissue and organ culture)

Biotransformation of compounds for more useful compounds (Cell, tissue and organ culture)

Production of new genetic lines of medicinal plants (Cell, tissue and organ culture).

Publications : >200 in journals of National and International repute.

Research Supervision :

27 research scholars awarded Ph.D. degree [Dr. Ratikanta Maity (1968), Dr. Nita Saha (1970), Dr. Arati Deb (1972), Dr. Anita Chowdhury (1972), Dr. Prabhanjan Samanta (1973), Dr. Arati Das Gupta (1974), Dr. Jyotirmoy Bhattacharya (1975), Dr. Purnendu Kumar Ghosh (1978), Dr. Saguna Dattagupta (1979), Dr. Gopa Sen (Ghosh) (1980), Dr. Swapan Kumar Data (1980), Dr. Basantika Mitra (1981), Dr. Manisha Sanyal (Sarkar) (1981), Dr. Karabi Datta (1983), Dr. Bani Basu (1983), Dr. P.C. Nandi (1984), Dr. Chhanda Bhaumik (Mandal) (1985), Dr. Sima Sen (1985), Dr. Shyamal Kumar Roy (1986), Dr. Rita Majumdar (1989), Dr. Dalia Dan (1990), Dr. Lutfar Rahman (1989), Dr. Ela Ghosh, Dr. Rinku Saha, Dr. Ajita Sen, Dr. Chhabi Maity, Dr. Santi Rani Mukhopadhyay]. Many other research scholars (pre- and post-doctoral) worked in the laboratory.

He used to publish **'Our Lab'-** a half yearly news of Botanical Lab of Pharmaco-anatomy, University of Calcutta.

Ph.D Students:

1. Dr. Ratikanta Maity
2. Dr. Nita Saha
3. Dr. Arati Deb
4. Dr. Anita Chowdhury
5. Dr. Prabhanjan Samanta
6. Dr. Arati Das Gupta
7. Dr. Jyotirmoy Bhattacharya
8. Dr. Purnendu Kumar Ghosh
9. Dr. Saguna Dattagupta
10. Dr. Gopa Sen (Ghosh)
11. Dr. Swapan Kumar Data
12. Dr. Basantika Mitra
13. Dr. Manisha Sanyal (Sarkar)
14. Dr. Karabi Datta
15. Dr. Bani Basu
16. Dr. P.C. Nandi
17. Dr. Chhanda Bhaumik (Mandal)
18. Dr. Sima Sen
19. Dr. Shyamal Kumar Roy
20. Dr. Rita Majumdar
21. Dr. Dalia Dan
22. Dr. Lutfar Rahman
23. Dr. Ela Ghosh
24. Dr. Rinku Saha
25. Dr. Ajita Sen
26. Dr. Chhabi Maity
27. Dr. Santi Rani Mukhopadhyay

MICROBIOLOGY

Initially the subject microbiology was included in Mycology section and dealt with mainly micro fungi. In our department the microbiology section was initiated by Prof. P.N. Nandi of Bose Institute, as part time faculty and initiated the work on soil micro flora. Later on, the expansion of microbiology laboratory was done by Prof A.K.Chandra and he introduced Microbiology as an independent discipline of specialization in the year 1972. He was one of the pioneers of Microbiology study and Research in this part of our state. Soon, microbiology laboratory of this department began to attract brilliant researchers from not only this department but also from Biochemistry, Agriculture, Pure Chemistry, Statistics, Pharmacy departments as well. His area of specialization included microbial enzymes, biofertilizers, antimicrobials and leaching of metals. Since 1990, Prof. A.K. Pal is in the charge of this division. Later Dr. B. Chaube also joined and continuing his work.

EMINENT TEACHER

Prof. Asish Kr. Chandra

Prof. Asish Kr. Chandra was born in 1937. He hailed from a family of academicians and scholars. He graduated from Presidency College and three of them together, Asish Kr. Chandra, Tarapada Chatterjee and Prabir Chatterjee, were came to be known as ATP of the Department of Botany. Prof. Chandra joined the University of Calcutta in 1962. His basic discipline was Plant Physiology, but he foresaw the huge development awaiting in the field of microbes and quickly adopted the techniques and nuances of Microbiology under the guidance of Prof. A.B. Banerjee of the Biochemistry Department.

As an invited scholar, he visited Washington State University in 1982. In 1983, he became a Professor and in due course became Head of the Department. He almost single handedly initiated operations of the Academic Staff College in this University. Botany was one of the first departments to start Refresher Course for college and University teachers through his able leadership. More than 20 scholars were awarded Ph.D. degrees from his laboratory. His untimely death in 1992 has left a void in this Department and we are continuing to feel the loss.

Ph.D. Students Prof. A.K. Chandra

1. Dr. Samarendra Nath Bhattacharya
2. Dr. Swapan Bhattacharya
3. Dr. Shyamal Roy
4. Dr. Bikas Pati
5. Dr. Asim Kr. Bhadra
6. Dr. Tapan De
7. Dr. Satya Ranjan Ghosh
8. Dr. Tribeni Krishnan
9. Dr. Malabika Roy
10. Dr. Sharmila Ghosh
11. Dr. Nina Srivastava
12. Dr. Supriya Majumdar
13. Dr. Sunipa Sengupta
14. Dr. Susanta Ghosh
15. Dr. Bhaskar Sanyal
16. Dr. Mahuya Banerjee
17. Dr. Sukumar Medda
18. Dr. Bijoy Shankar Ghosh
19. Dr. Basanta Chowdhury

PLANT MOLECULAR BIOLOGY

The plant Molecular Biology Laboratory was established by Prof. Rajat Kanti Chaudhuri in this Department in the year 1967. The then Lecturer of Botany, Dr. Chaudhuri joined the Biology Department of Howard University (USA) as Anna Fuller Postdoctoral fellow– to get research training on molecular biology. His training was very fruitful as the *Neurospora crassa* Laboratory of the Biology Department of Howard University had an active collaboration with the Carnegie Institute of Washington DC, National Institute of Health at Bethesda. He was exposed to the cradle of molecular biology facility, especially under Dr. David Khone and Dr. Bill Hoyer. At that time Genes were isolated at these institutes. He was also trained at Cancer Research Center of the National Institute of Health at Bethesda, Maryland (USA).

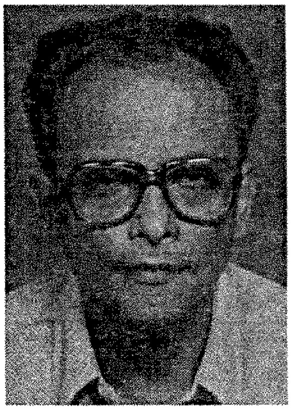
Under their guidance he fractionated *Neurospora crassa* genome into unique and repetitive DNA fractions, and also isolated total RNA, transfer RNA and ribosomal RNA. The training at the USA laboratories was helpful, in later years when he established his plant molecular facility at the Department of Botany, University of Calcutta. At that time he was pioneer in plant molecular biology researches in this university. He isolated and purified plant and animal genome DNAs, total and other RNA species and plant protein using column chromatography, cesium chloride and sucrose density gradient centrifugations etc. His expertise on DNA-DNA and DNA-RNA hybridization, column fraction for DNA, RNA and protein, DNA reassociation kinetics, genome size determination using ½ Cot values, DNA sequence divergence by temperature melting profile ™ profiles, gene isolation and expression. His researches on *N. crassa* molecular genetics was recorded in publications in journals like Molecular General Genetics, Genetics, Experientia, BBRC, Neurospora Newsletter, IRRI Newsletter etc. This training had enabled Dr. Chaudhuri to earn fame in dealing with plant DNA and RNA establish in his *plant molecular biology laboratory* at the Department of Botany, CU that ultimately awarded him with Rockefeller Foundation award on rice plant biotechnology.

In early 1980's, the then Head of the Department Professor Sharma entrusted Dr. Chaudhuri and his colleague Dr. Sibdas Ghosh to start cell biology special paper in Botany. However, Dr. Chaudhuri continued on his plant molecular biology research in his plant molecular biology laboratory, with the financial supports of different granting agencies like Department of Atomic Energy–to initiate study biochemical basis of crown gall tumorogenesis in plants. Almost simultaneously University Grants Commission sanctioned money to study antibiotic and caffeine action on animal cells. His endeavor is one of pioneer research group to work on *Agrobacterium* infection and crown gall tumorogenesis sin India. His observation on initiation of crown gall infection with lipopolysaccharide binding of the bacterium with plant cell wall lipopolysaccharide is a pioneer work on this area. nother important finding of his group is the observation that rice plant genome harbors nitrogen fixing genes. Also, his experience on DNA fractionation over column chromatography had enabled his students to fractionate model plant *Solanum nigrum* genome, and perhaps solved its long-standing species complex status.

Dr. Chaudhuri is the pioneer in DNA cloning and sequencing at the University of Calcutta. Before him no teacher or scientist had attempted for these techniques, in any department of the University of Calcutta. His expertise on plant molecular biology had earned him international recognition for which this university was placed in the international rice biotechnology network, out of two dozen institutes and universities throughout India.

Presently molecular biological researches are going on in all most all the laboratories of the department working with different branches of Botany.

EMINENT TEACHER



Prof. Rajat Kanti Chaudhuri

Date of Birth : 15-05-1938

Designation : Professor of Botany, CU; Adjunct Faculty of Biophysics, Molecular Biology & Genetics Department, CU; and Biotechnology Department, CU and then Emeritus Fellow (UGC)

Research experience : Since 1959

Teaching experience : Since 1967

Prof Chaudhuri had his research training on plant chromosomes under Professor Arun Kumar Sharma, after his Master of Science degree with thesis paper on cytogenetics in 1960. His data were published in three international publications. At pre-doctoral phase (*second phase*), he worked on chromosome of some pteridophyte (*Selaginella* and fern and *Solanum*) species–to note the phylogeny of these groups. For fulfilment of his Ph.D. degree he studied chromosome changes after application to strong beta radiation (from phosphorous^{32} and sulphure^{35} isotopes), and also to phenols and plant pigment.

Among the research scholars who enrolled under Dr. Chaudhuri, his wife Dr. Mrs. Ila Chaudhuri was first one. Significance of her study was presence of lipopolysaccharide molecules presence on *Agrobacterium* to plant cell membrane surfaces are key molecules to make the first contact amongst these two organisms. This was published in BBRC in 1980, jointly with Prof. G.C. Chatterji's group at the Biochemistry Department, CU. Similarly, the DNA base-stacking position of caffeine molecules was found to influence DNA reassociation kinetics after *in vivo* caffeine treatment in mouse body. At that time this department had no sophisticated instruments like ultracentrifuge, high speed cold centrifuge, scintillation counter etc. At that phase, with the assistance of post doc students she standardized molecular biology techniques at Dr. Chaudhuri's lab. Later on, when the sophisticated instruments were installed at the Centre of this Department, a number of projects were sanctioned to Dr. Chaudhuri.

Since early 1980's Dr. Chaudhuri started his Visiting Scientist carrier in foreign countries. He visited many countries as Visiting Scientist at the Botany Department of the Howard

University (USA), National Institute of Health, Bethesda, State University of New York (Albany), Georgia University, Athens, Georgia, University of California, Barkley, International Rice Research Institute (Philippines), Biology Department of the Cornell University, Ithaca, USA–to train himself on advance techniques of molecular biology, to train himself on genomic library construction and cDNA clones. He also organized and attended many International Meetings/Conferences and Symposia as Convener or as a member of Organizing Committee.

Ph.D Students:

Dr. Ila Chaudhuri (Thesis submitted under Prof. A.K. Sharma)

1. Nandan Bhattacharya
2. Arabinda Das
3. Prabhat Mallik
4. Amalangshu Sekhar Banik
5. Abhijit Bandopadhyay
6. Abhijit Datta
7. Debasish Roy
8. Anup Das
9. Manoj Prasad
10. Moul Dey
11. Sushma Misra
12. Moloy Roy
13. Mahanga Singh
14. Rajarshi Roy
15. Rajib Bandopadhyay
16. Pompeeya Basu
17. Mukesh Singh

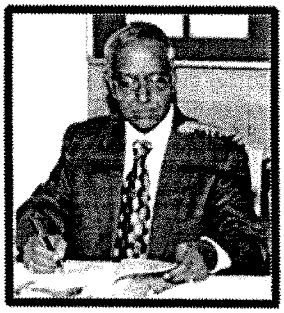
Research Associates :

18. Dr. Ila Chaudhuri
19. Dr. Dillip Mukhopadhyay
20. Dr. Kunal Mukhopadhyay (Rockefeller Foundation Fellow–positioned as Professor of Biotechnology, BIT, Mesra) assisted Dr. R.K. Chaudhuri.

Projects Implemented - 12

Present Faculty Profile

Prof. Nandadulal Paria



Born in the district of Midnapore in 1950, Prof. Paria obtained his M.Sc. degree from the Calcutta University in 1972. He obtained his Ph.D. degree of the same University in 1983 for his thesis on the 'Sleep Movement of Plants' under the supervision of Prof. S.C. Datta. Prof. Paria joined the Department in 1974 as the Keeper of the Herbarium. Subsequently, he became a Lecturer in 1983 and rose to the position of a Professor. He was the Head of the Department of Botany and Chairman of the Board of P.G. Studies in Botany for two years (2005-2007). Prof. Paria served as the Vice-Chancellor of the Vidyasagar University for about a year in 2011. He rejoined the Department after quitting Vidyasagar University and presently is a Professor of Botany (on reemployment).

Prof. Paria is engaged in the teaching of taxonomy of angiosperms, biosystematics, evolution, biodiversity and conservation, ethnobotany, palynology and modern trends both in the general and special courses. His areas of research span a wider field that includes Floristics, Biodiversity and Conservation, Palynology, Ethnobotany, Medicinal Plants, Biosystematics and seed and seedling morphology.

Prof. Paria's notable contribution to floristics include the account of the 'Flora of Ballygunge Science College Compound' (1978), 'Herbaceous flora of South 24 Parganas' (1979), 'Chilkigarh' (1994) and 'The Flora of Hazaribagh District, Bihar' (2000) published by the Botanical Survey of India. His interest in the medicinal plants led to the publication of 'Medicinal Plant Resources of South West Bengal' published by the Directorate of Forests, Govt. of West Bengal. He had been the contributing author for the botany part of 'A Treatise of Indian Medicinal Plants' (vols. I-VI)' by Prof. Asima Chatterjee and Dr. S.C. Pakrashi, published by the CSIR. He extended his research topic in the study of pollen morphology of different families of flowering plants.

He introduced and developed the research in seedling morphology in India by his continued passion in this field. He has studied the seedling morphology in aspects ranging from taxonomic markers, identification, interrelationships amongst taxa and evolution to its application in forestry, reintroduction and management of phytodiversity. A large number of families, taxonomic and ecological groups including character correlation have been studied by him and his group. He is considered a pioneer in the research of Seedling morphology in India. Prof. Paria has guided sixteen students for their Ph.D. degree, published more than eighty papers in national and international journals and six books.

Awards and Honours : He is the recipient of the Finnish Government Post Doctoral Scholarship (1986); V.V. Sivarajan Gold Medal (1999) from the Indian Association of Angiosperm Taxonomy

(IAAT); and the S.K. Jain Gold Medal (2007) from the Association of Plant Taxonomy (SAPT). He is a Fellow of the Linnaean Society, London, Indian Botanical Society, IAAT, APT, and the West Bengal Academy of Science & Technology. Prof. Paria is a member of the West Bengal Biodiversity Board, besides being life member of different learned societies. He acted as editor of the Indian Science News Association and the Botanical Society of Bengal. He was also a Dean, Faculty of Fine Arts, Music and Home Science, Calcutta University.

Projects implemented - 14

Paper published – 80

Book published – 07

Research group : Sixteen (16) students have been awarded Ph.D. degrees. Five (5) students are working at present for their Ph.D. degrees.

Prof. Sumita Jha

Dr. Sumita Jha, Professor and Coordinator, Centre of Advanced Study, did her M.Sc. and Ph.D. from Department of Botany, C. U. under the guidance of Prof. Sumitra Sen and joined as Lecturer in Botany in 1990.

Area of specialization : Cytogenetics and medicinal plant biotechnology.

The significant scientific contributions of Prof. S. Jha, cover a wide area of research in medicinal and economic plants including study of genetic diversity and chromosome constitution as associated with difference in chemical contents, *in vitro* propagation and conservation of recalcitrant species and finally enhanced production of secondary metabolites *in vitro* and through transgenesis.

A comprehensive and critical analysis of the cytological races of Indian squill and their main active principles led to establishment of the fact that Indian squill, which was considered a mixture of *Urginea* and *Scilla*, consists of *U. indica* only, as *S. indica* was completely devoid of scilladienolides contrary to earlier claims. In *Urginea indica*, Indian squill, along with success in micropropagation, chromosomal diversity has been correlated with bufadienolide content of selected genotypes. Methods have also been developed for rapid propagation of species of *Ruscus, Bowiea, Smilax, Cephaelis, Withania, Tylophora, Taxus, Gloriosa, Plumbago, Bacopa* as well as in Tea and Cashew nut. While karyotype stability in long term callus derived plants have been demonstrated in *Rucus hypophyllum* and *Crepis tectorum*, variability in chromosome number and structure has been demonstrated in tissue culture regenerated plants of Indian squill. On the basis of work done in the laboratory during 1990's, it was demonstrated that induction of mitosis in polytenic nuclei *in vitro* could be a probable source of somaclonal variation in this species.

Dr. Jha and her associates have been working on tissue culture for biomass production and secondary metabolite accumulation, which has been applied for enhancement of production of several active principles such as bufadienolides like scillaren and proscillaridin, alkaloids like emetine, cephaeline, colchicine, tylophorine, withanolides, artemisinin, forskolin, taxol, taxanes and podophyllotoxins in cell cultures, organ cultures and in micropropagated plants of selected genotypes of medicinal plants. In Ipecac, technique could be devised to overcome recalcitrance and production of alkaloid in cell and root culture.An innovative process for the production of podophyllotoxin in cell culture of Indian *Podophyllum* has been developed for which a patent has been filed on improvement in production of pododphyllotoxins in cell cultures of *Podophyllum hexandrum*.

Transformed cell and organ cultures have proved valuable in the study of different aspects of secondary metabolism as the transformed cultures are more stable genetically and biochemically over long periods in culture. *Agrobacterium tumefaciens*-mediated transformation in *Coleus forskohlii* for forskolin production was first reported by this group in 1996 and in *Withania somnifera* for production of withanolides in 1999. Since then, the group has developed transgenic cell and organ cultures using *Agrobacterium rhizogenes* in a number of rare, endangered indigenous medicinal plants for production of high value pharmaceuticals.

Improvement in plant growth and secondary metabolite production through genetic mimicry of pathogen attack: Dr. Jha's group in collaboration with a French group have contributed to the understanding of the effect of crypt gene expression in transgenic hairy root cultures of several medicinal plants aiming at enhancement of bioactive secondary metabolites. The rational of such study was based on the principle of transgenic mimicry of pathogen attack that apparently expected to stimulate the synthesis of natural products. In an effort to genetically mimic the observed effects of cryptogein, we employed *Agrobacterium rhizogenes* to insert a synthetic gene encoding cryptogein into the roots of *Bacopa monnieri*. In whole plants of *Bacopa monnieri*, transformation with the cryptogein gene led, to increases in the bacosides. In the present study of biochemical phenotype, we showed that transgenic mimicry is correlated with increased secondary metabolite production in transformed root cultures and whole plants. We propose that natural transformation with genes encoding the production of microbial elicitors could influence interactions between plants and other organisms. On the basis of results achieved, a patent has been recently filed by us.

Presently, further studies to evaluate metabolic perturbence in cryptogein cotransformed root cultures and transformed plants are being pursued in *Nicotiana tabacum* and *Withania somnifera* in collaboration with Agricultural and Food Engineering division, IIT, Kharagpur as well as in several indigenous medicinal plants including *Arachis hypogea, Bacopa monnieri, Plumbago sp., Swertia sp., Tylophora indica.*

Chromosomal Explorations, Phylogeny and Diversity in Orchidaceae and Hyacinthaceae: A detailed account has been reported of attendant polysomatic variation in planta and elucidation of the modal karyotype in the difficult-to-study endangered orchid *Bulbophyllum auricomum*, known as the Royal Flower of Myanmar. The somatic chromosome number of *B. auricomum* (2n = 38) is reported for the first time. The polyploidization in seed-derived plants clearly indicates the heterogeneous nature of orchid seed stock.

The aim of the ongoing research on members of Hyacinthaceaea is to gather consistent cytological information to consolidate our existing knowledge, elucidate taxonomic relationship and obtain possible insights into the evolutionary processes within the groups. Taxonomic delimitation of Hyacinthaceae has been controversial since the time of Linnaeus due to the absence of reliable discriminating characters. An improved method of genome size estimation by flow cytometry in Hyacinthaceae has been developed for determining 2C values of *Drimia spp, Ledebouria sp,. Dipcadi spp, Ornithogallum spp., etc.* Fluorescent chromosome banding was performed Indian species of *Drimia* for the first time to elucidate taxonomic relationship and obtain possible insights into the evolutionary processes within this group.

The genus *Asparagus* native to South Africa comprises three subgenera of cladode bearing plants: *Protasparagus*, *Asparagus* and *Myrsiphyllum*. We have demonstrated an explicit interspecific phylogeny of *Protasparagus* based on ribosomal DNA internal transcribed spacer region (ITS1-5.8S-ITS2) sequence conservation. Furthermore, we analyzed the chloroplast DNA tRNA-Leu intron sequences of nine taxa of *Protasparagus* along with their cladode morphology, anatomy and stomatal characteristics to illuminate the obtained rDNA ITS phylogeny of this subgenera.

Evaluation of Cytogenetic diversity in some genera of Cucurbitaceae: Cucurbits are a large vegetable yielding family for which identification and understanding the modes of sex expression in different species can help to build basic knowledge to improve breeding strategies in future. In cucurbits, we find a number of genera with varied sexual systems. Considering these aspects, chromosome evolution and development of molecular marker in dioecious cucurbit genera have been the prime objectives of present programme. Cytological investigations form an indispensible part of the process of study of evolution in sex chromosome. Karyotype analysis and meiotic behavior of the typical dioecious cucurbit *Coccinia indica,* was done in detail by CMA/ DAPI staining through EMA method applied for the first time in this dioecious species. In collaboration with SOA University, Biotechnology Department, we have developed an ISSR based STS marker for sex identification in pointed gourd (*Trichosanthes dioica* Roxb.) and a SCAR marker in *Coccinea grandis.*

We are part of the team who have developed a Comprehensive Chromosome database for Plants from Indian laboratories and recognised as one of the Bioresource Information Centre (BRIC-III) of Indian Bioresource Information Network funded by Department of Biotechnology (GOI).

Awards Received and Recognitions Obtained

1. Fellow—The National Academy of Sciences, India (2008)
2. Member, PAC—Plant Science—DST (GOI) (2007-2012)

3. Member, SEC on life Science, WOS-DST (GOI) (2013-)
4. Member, Project Monitoring and Supervision Committee, DST, Govt. of West Bengal (2012-)
5. Nominated for "Prof. Umakant Sinha Memorial Lecture 2012", Awarded by the Indian Botanical Society.
6. "UGC Career Award for young teachers" 1994-1997 awarded by the University Grants Commission, New Delhi.
7. "Prof. Hiralal Chakravarty Award" for the year 1989 for significant contribution in Botany by the Indian Science Congress Association.
8. "Science Academy Medal for Young Scientist, 1983" awarded by the Indian National Science Academy (INSA).

Other Commitments :

- UGC Nominee Advisory Committee, SAP, Dept. of Botany, Nagaland University (2011).
- UGC Nominee Advisory Committee, CAS-Phase II, Dept. of Botany, NEHU, Shillong (2012-)

UGC Nominee Advisory Committee, Centre on Bioprospecting of certain medicinal plants for health care, Osmania University, Hyderabad (2012-)

Programme Coordinator, UGC-CAS in Botany, C.U. on and from 2004 till date.

Coordinator, M.Sc. Programme in Genetics, University of Calcutta (2002-2009).

Convenor, Ph.D. Committee in Botany, University of Calcutta (2011- till date)

Convenor, Ph.D. Committee in Genetics, University of Calcutta (since inception -2011)

International Collaborations (with institutions, man-power trained) :

1. MOU with Molecular Cytogenetics Laboratory, Department of Botany, Dhaka University, October 2010 (ongoing).
2. TWAS Research Associate from Myanmar.
3. Indo-French Collaboration Programme as Principal Collaborator (2002-2006) sponsored by Indo-French Centre for Promotion of Advanced Research, New Delhi, with Dr. David Tepfer, INRA,Versailles, France.

RESEARCH PROJECTS IMPLIMENTED : 15

Paper published – 90

Books and book chapters – 20

Research group

Ph. D. Students :

1. Swapna Mukhopadhyay
2. Sudripta Das
3. Swagata Ray
4. Mukul Manjari Datta

5. Maumita Bandyopadhyay	6. Kuntal Narayan Chaudhuri
7. Seemanti Ghosh	8. Anrini Majumder
9. Myo Ma Ma Than	10. Sukanya Biswas
11. Nishakant Pandey	12. Dipasree Roychowdhury

Research Scholars working for Ph.D.

1. Amrita Basu	2. Bipradut Sil
3. Mihir Halder	4. Biplab Kumar Bhowmick
5. Patha Sarathi Saha	6. Pijush Paul
7. Tapojita Samaddar	8. Sayantani Nath

Post Doctoral Fellows:

1. Dr. Anrini Majumder—WOS-DST (GOI)—2011
2. Dr. Myo Ma Ma Than—DBT—TWAS—Post Doctoral Fellow—2013

Dr. Anita Mukherjee (Professor)

Professor Anita graduated from the Presidency College in 1975 and was ranked first in first class. She obtained her Ph.D degree in Botany from the University of Calcutta in 1985 under the supervision of Professor (Mrs) Archana Sharma. She joined the department as lecturer in the year 1990.

She pioneered the development of Single Cell Gel Electrophoresis technique (Comet assay and DNA diffusion assay) on plants in India. She developed and validated methods for assessing genotoxicity of chemicals disposed in the environment through natural and anthropogenically mediated processes. Professor Mukherjee initiated the area of engineered nanomaterial toxicology and addressed their concern regarding their fate in biological systems, plants in particular; the challenges were addressed and the genotoxic responses were elegantly demonstrated at different trophic levels (plant and animal systems). Her research on the engineered nano particles for their consequent novel interactions with DNA, have been widely cited in journals of repute and bestowed with the membership of the American Nano Society. She has to her credit over 90 publications in peer reviewed international journals, two reviews/book chapters. She has won several honours and awards, has several collaborations with scientists from the Czech Republic, Korea and Nigeria as well as with in the country. She has successfully supervised 10 Ph.D. students and has been invited to speak at many international meetings and chair symposia. She was the head of the department of Botany (2013-2014) and the head of the department of Genetics during 2011 to 2013.

Teaching Interests :

In the post graduate course of Botany, Professor Mukherjee co-ordinates and teaches Cell

Biology and Biomolecules in the first semester, both theoretical and practical's; and in the fourth semester, she teaches, supervises projects and coordinates the special paper Advance Cell biology (both theoretical and practical). As an adjunct faculty she participates in course lectures of the department of Genetics during the first, second and fourth semester.

Research Interests :

Professor Mukherjee's research interests include Population cytology of chromosome variants in the family Asphodelaceae, assessing genotoxicity of natural and anthropogenic compounds, looking for lead compounds from some plants of ethnobotanical importance for their antimutagenic and anticlastogenic properties as well as finding suitable plants for restoration of mine spoils and contaminated sites.

Dr. Subir Bera

Designation : Professor

Date of birth : 09.02.1962

Date of joining : 16.11.2000

Teaching :

After serving different prestigious government institutions like Darjeeling Govt. College (West Bengal Education Service, from 1989-1995) and Presidency College (1995-2000) as faculty member he joined the University of Burdwan as Reader in the year of 2000. After a short period (from 4.7.2000–15.11.2000) in Burdwan University, he joined the Department of Botany, University of Calcutta in 2000 and became Professor in 2006.

Awards and Honors :

Prof. Bera received **"S.S. Bir Gold Medal 2008"** by Indian Fern Society, Patiala for significant contribution in research on Pteridophytes. He has been awarded Fellow, Indian Palaeobotanical Society, Lucknow in 2014 and Fellow, Indian Fern Society, Patiala in 2008 . He was awarded visiting fellowships for three times i.e. 2004, 2005 and 2007 from Institute of Botany, Chinese Academy of Science, Beijing, China for collaborative work in the State Key Laboratory of Systematic and Evolutionary Botany of CAS, China.

Research Interest :

Prof. Bera has more than twenty-five years of teaching experience of different aspects of Palaeobotany, Palynology, Pteridology, Gymnosperms and Plant anatomy. He also has more than twenty-eight years of research experience. His research interests include evolutionary biology, plant-animal interaction, reconstruction of biostratigraphy, palaeoclimate and palaeogeography of different regions of Indian subcontinent (especially Bengal Basin and Eastern Himalayan regions) and some parts of south-east Asia since last 250 Ma, archaeobotany, melissopalynology, xylotomy, forensic botany etc. He and his research group have quantified monsoonal variations for the first time in the eastern Himalayas since last 15 Ma and demonstrated signal of monsoonal intensification during that time. Using xylotomical tool and plant fossils, he and his group suggested the route of migration of a large no. of plant taxa since the collision of the Indian-Asian plates. His further works include man-environment interaction in south and south-east Asia since late Quaternary time. His effort resolving enigmatic origin of terracotta warriors in the Qin Shihuang Mausoleum, China has fascinated the scientific community of the world. He and his students for the first time established the efficacy of phytoliths in reconstructing deltaic environments along salinity gradient of the Sunderbans.

His recent venture is to establish a preliminary relationship between modern phytolith spectra reflected in modern plants and surface sediments of different vegetation zones of eastern Himalayas along altitudinal gradient using phytolith indices which will provide a basis for the reconstruction of Late Quaternary environmental changes in the area. He has published about 140 research articles in peer reviewed journals and mentored 13 Ph.D. students. He has implemented nine research projects funded by different agencies of GOI like DST (ESS), New Delhi, DST (Life Sciences), New Delhi, UGC, New Delhi, and CSIR, New Delhi.

Publications (Journal, Review, Book) :

Total no. of published articles : 144 (Research article: 140; General article: 4)
Books : 3
Book review : 1

Research Group :

Dr. Ashalata D'Rozario, Dr. Illora Sen, Dr. Biplab Patra, Dr. Dipak Kumar Paruya, Dr. Sudha Gupta, Dr. Ruby Ghosh, Dr. Mahasin Ali Khan, Dr. Arkamitra Mandal, Dr. Sandip More, Ms. Sayantani Das, Mr. Subha Brata Dey, Mr. Biswajit Mukherjee, Ms. Soma Majumdar, Ms. Soma Khanra, Mr. Anandamoy Bandyopadhyay, Mr. Debasis Upadhyay, Ms. Anwesha Biswas, Mr. Madhab Naskar, Mr. Ahinsuk Barua, Mr. Binod Saradar.

Dr. Asok Kumar Biswas (Professor)

Date of birth : April 8, 1952

Date of joining : August, 2004

Teaching-Plant Physiology and Biochemistry

1. Ramakrishna Mission Vivekananda Centenary College, Rahara, 24 Pgs (N) as faculty member from 1975-2003.
2. Department of Botany, Calcutta University as Professor of Botany from 2004 onwards.

Awards and Honour :

a. Recepient of Agharkar Commemoration Medal in 1981 for published research work done in India on Botany from University of Calcutta.

b. Recepient of Sir Asutosh Mukherji Medal in 1983 for research work done in India from University of Calcutta.
c. Received Visiting Associateship from the University Grants Commission in 1995 for research work on "Characterization of salinity stress in rice".
d. Received National Scholarship in 1986 from the Ministry of Human Resources Development. Government of India to carryout Post-Doctoral Research with Professor Russell Jones in the University of California, Berkeley, U.S.A.
e. Received Biotechnology National Associateship from the Department of Biotechnology, Government of India to carryout research work in the Bose Institute, Calcutta in 1992 and in the laboratory of Professor RG Hermann, Institute of Botany, Munich, Germany to learn techniques for research work on chloroplast molecular biology in 1994.
f. Member of the Expert Committee constituted by the University Grants Commission, New Delhi.

Research interest : Our laboratory is involved to study seed germination, growth and metabolism in cereals and pulses regulated by various chemicals that includes NaCl, $CaCl_2$, Arsenic, Selenium. By adopting hardening technology we have demonstrated NaCl alleviates salt stress by enhancement of antioxidant defense system and osmolyte accumulation in various pulses. We also demonstrated inhibition of growth and metabolism in rice and mungbean seedlings induced by arsenic. Joint application of phosphate with arsenic showed significant alterations on all parameters tested under the purview of arsenic treatment alone leading to better growth and metabolism in the test seedlings. Plant foods are the major dietary sources of selenium. Keeping in mind the nutritional importance of selenium, studies are conducted to characterize the effect of selenium and sulphate, either alone or in their combination on growth and metabolism in cereal seedlings. Since calcium plays an important role in cell signaling, studies are also conducted to measure its interaction in plants treated with NaCl, $CaCl_2$, Arsenic, Selenium, Phosphate, Sulphate and Silicon.

Research group : Dr. Bhaskar Choudhury; Smt. Papiya Saha; Smt. Debarati Das; Smt. Srijita Ghosh; Smt. Paramita Chatterjee; Smt. Jayeeta Saha; Smt. Paulin Seal; Sri. Prabal Das.

Dr. Sandip Mukhopadhyay (Professor)

Prof. Sandip Mukhopadhyay obtained his M.Sc. and Ph.D. degree from the Department of Botany, University of Calcutta in 1977 and 1985 respectively. During his Ph.D. program, he worked on Chromosome analysis of members of the family Marantaceae and *in vitro* studies of *Costus speciosus* under the guidance of Professor A.K. Sharma in a DST funded project as JRF and SRF. The different species of three genera, *Calathea, Maranta* and *Stromanthe* under Marantaceae revealed occurrence of aneuploidy in addition to normal somatic chromosome complements. In species of *Calathea*, somatic chromosome number varied between 2n=24, 26 and 28. In species of *Maranta*, it varied between 2n=48 and 52. One species of

Stromanthe showed 2n=44 chromosomes. *In situ* cytophotometric estimation of 4C nuclear DNA was also carried out in these species and revealed variability in nuclear DNA contents and no direct correlation was observed with ploidy levels. The callus culture was induced from young growing rhizome segments of three populations of *Costus speciosus* and the diosgenin contents were analyzed in actively growing callus tissues. The unorganized mass of cells revealed lesser amount of diosgenin when compared with that of field grown plants.

After completing his Ph.D. program, he was awarded Research Associateship by the CSIR, Government of India and worked for a year before he was invited by the Department of Biology, Laval University, Quebec, Canada as Visiting Scientist. He left for Canada in August, 1989 and worked on Nucleolus Associated Bodies (NABs) in *Cicer arietinum* and *Pisum sativum* in the Department of Biology with Professor JG Lafontaine. He first showed clearly the presence of satellite part (SATs) of chromosome and NABs in close proximity of the NOR at interphase utilizing both nuclease and protease gold labelling techniques and immunochemistry at the ultrastructure level. Both RNase and protease-gold labelling techniques clearly showed high concentration of RNP particles in NABs and almost absence in SATs. On the other hand, DNase-gold labelling technique showed reverse results. The presence and absence of DNA in both SATs and NABs respectively was confirmed by anti-DNA immunochemical technique. After one year, he joined as Research Associate in the Department of Plant Science of Laval University and worked on protoplast culture and genetic transformation of asparagus (*Asparagus officinalis*) through the insertion of DNA into the protoplasts. He first established direct gene transfer protocol for asparagus through electroporation of protoplasts and developed transgenic asparagus. During his 6 years stay in abroad, he published 9 articles in well reputed international journals and participated in different seminars and symposia in both USA andCanada.

Prof. Mukhopadhyay joined this department as Lecturer on Teacher's day in 1995 and continuing his teaching and research programs on Genome analysis and Plant Biotechnology. His line of interest is genome analysis utilizing chromosome parameters as well as biochemical and molecular markers of both *in vivo* and micropropagated plants of both monocots and dicots with medicinal importance. He has successfully established micropropagation system of all these plants utilizing both meristem multiplication and somatic embryogenesis. His special interest is to study the factors regulating genomic stability and instability of *in vitro* propagated plants.

Prof. Mukhopadhyay has worked on different species and varieties of *Asparagus*, *Allium*, *Iphigenia*, *Gloriosa* of Liliales, *Mucuna pruriens* & *Clitoria ternatea* of Fabaceae, *Mentha* & *Ocimum* of Lamiaceae, *Tabernaemontana divaricata* & *Rauwolfia serpentina* of Apocynaceae; *Hemidesmus indica* of Acanthaceae; *Calathea* and *Maranta* of Marantceae. His field of study involves several facets.

a. **Chromosome analysis :** The genomes of all these medicinally important plants have been analysed utilizing chromosome parameters and indicated the possible role of ploidy and minute structural alterations of chromosomes for intra-specific and inter-specific differences and play an important role in species and varieties evolution.

b. ***In situ* cytophotometry and FACS analysis :** The nuclear DNA values of these plants have also been quantified using Feulgen microspectrophotometry and in most cases no direct correlation was observed between the ploidy level and 4C nuclear DNA amounts. However, nuclear DNA values can be utilized as one of the parameters for genome analysis. Genomic ploidy status was also verified using FACS in some species of *Asparagus* and different varieties and strains of *Mucuna pruriens.*

c. **Biochemical study :** The total protein profiles of different genomes are also studied to evaluate phylogenetic relationships among the species and varieties of these plants. The results revealed specific total protein profile for each genome.

d. **Molecular study :** The total genomic DNA has been analyzed in some species of *Asparagus*, *Calathea*, *Maranta*, *Tabernaemontana*, *Clitoria* and different varieties and strains of *Mucuna pruriens.* Both RAPD and ISSR techniques revealed efficiency of such techniques in evaluating those genomes with similar chromosome numbers.

e. **Micropropagation :** The specific, simple and efficient methods of micropropagation for each genome of different species and varieties of *Asparagus, Allium, Gloriosa, Iphigenia Mucuna, Clitoria, Mentha, Ocimum* and *Hemidesmus* has been established for complete regeneration of plants in culture utilizing direct shoot bud multiplication as well as callus regeneration through either morphogenesis or/and somatic embryogenesis. It was observed that the duration of total culture period and period of exposure to a potent auxin, like the 2,4-D during culture affect the genomic status of the cultured plant. An exposure to high auxin content for long period may result into the genomic instability. Moreover, cells cultured in liquid medium for long period show stability in genomic constitution than solid culture in species of *Allium*. In *Asparagus officinalis*, a true tetraploid clone has been raised through somatic embryogenesis.

f. **Metabolic Engineering :** The medicinal principles of different important plants have been analysed as well as different strategies have been successfully applied for enhancement and continuous elevated production of such costly medicinal contents. The level of respective important secondary metabolite production has been elevated significantly from precursor and elicitor fed cultures of *Iphegenia indica*, species of *Gloriosa*, *Mentha* and *Ocimum*. The L-DOPA content has also been enhanced by simply modifying the culture conditions from *Mucuna pruriens*. Our studies have clearly demonstrated the suitable methods of continuous production of different medicinally important chemicals at elevated level during culture maintaining the original elite clones of different medicinal plants for conservation.

Projects implemented — 9

Paper published — 81 (59 in peer reviewed journals)

Number of Research Fellows — 10 (8 awarded Ph.D. degree)

Dr. Ruma Pal (Professor)

Dr. Ruma Pal born in 1958, graduated from Lady Brabourne College, Calcutta and did her Master degree from this Department in the year 1980. She obtained her Ph.D. degree on algal cytogenetics under the guidance of Dr. Probir Chatterjee. She had a long un-interrupted research career of 17 years as JRF of UGC, SRF and RA of CSIR, RA of Department of Ocean Development and DST young Scientist in different departments and in Multi Institutional programs before joining as a Lecturer in Botany at Narsingha Dutta College in the year 1997. After two years she joined in Presidency College Calcutta and finally in this department on December, 2000.

Research Activities:

Prof. Pal started her research career in the field of algal cytogenetics, especially on algal family Characeae as part of her thesis work and reported the evolutionary trend among the members of this highly evolved class on the basis of polyploidization and nuclear DNA content. She also reported the orcein banding pattern of chromosome of *Chara* and *Nitella* and published in Current Science–till date which are the only report throughout the world.Later on she worked on many projects related to ecology and algal biotechnology as post doctoral work.

After joining as a teacher in charge of Phycology, her research is mainly focused on morphological and molecular diversity of microalgae from Kolkata and coastal West Bengal and the scope of Algal Biotechnology in relation to bioremediation, aquaculture, bio-fuel production CO_2 sequestration and nanotechnology. Research Programs related to phytoplankton-nutrient dynamics and ecological modelling are also included in her studies.

A comprehensive study on algal diversity of South Bengal, especially from Sunderbans became a valuable document of algal floristic study. Exploration of different islands and Mangrove forest of Sunderbans under an all India net work program on algal biofuel research in 'New Millenium Indian Technology Leadership Initiative Program' of CSIR, Govt. of India, enabled her to document the availability of potential algal taxa for biotechnological purposes and for mapping Sunderbans algae. She and her research group had already reported—algal taxa from this area which became a valuable documents for new researchers.

Bioremediation study includes removal of heavy and toxic metals and radio-nuclides using algae as bio-reagents from natural habitat and in uni-algal cultural conditions using Tracer packet Technique, Neutron Activation methods and Atomic Absorption Spectrophotometry. Separation of precious metal gold and bio- transformation to nano-gold and silver had already been reported by her group in an extensive study. To understand Algae-metal interaction at cellular level, the mode of action of individual metal like Pb, Cr, Cd, Au,Ag and As for different algal genera have already been determined. Different models of Bio-filter for toxic metal removal have been developed using algal bioreagent. After surveying the algal flora of arsenic contaminated villages of North 24-parganas, arsenic tolerant algal genera have been isolated and grown in laboratory condition and hypothetical proteins have been characterized from arsenic resistant cyanobacteria.

Use of highly nutritious, non-conventional local algal genera in aquaculture feed preparation and their role in fish dietetics in relation to growth and immunity is another research program of her group and was initiated in collaboration with Dept. of Fisheries, Govt. of West Bengal. Different types of algae based fish feed like, Total Supplement ,partial replacement by algal mix and value Added Feed have been tested and are found to be suitable for early larval transformation for prawn ,better growth performances and enhancement of neutraceutical properties of carp fishes and as color elicitor for colored fishes. This line of work was also supported by UGC-UPE scheme of Calcutta University.

Mass production of economically useful microalgae using Photobioreactor and Open race way Pond have been standardized in eastern India for the first time by Prof. Pal (since 1990) and regular training of the villagers for mass cultivation and feed production through NGO is their Lab to Land program.

Development of ecological model based on phytoplankton diversity in relation to seasonal variation, nutrient cycle and other physico- chemical parameters of fresh water wetland, estuary and coastal area of West Bengal have already established.

Together with algae-biodiesel project, Govt of India has identified her lab as one of the partner for investigating the role of algae in CO_2 sequestration program and has been invited to work on the role of cyanobacteria and algae in CO_2 sequestration process in natural wetlands of Sunderbans and in experimental algae culture set up.

She had collaborations with CSMCRI, Bhabnagar, IICT, Hyderabad, IIT-Kharagpur, Saha Institute of Nuclear Physics. Dept of Zoology, Microbiology and Biochemistry of this University. Prof. Pal is the pioneer researcher in the field of Algal Biotechnology in Eastern India and popularized the algal research in different fields as well as involved in transferrimg her innovative technologies among the rural people of West Bengal through NGO.

Projects implemented — 15

Paper published — 75

Book published — 3

Patent — 2 With CSIR Laboratory, IIT Kharagpur and Dept. of Biochemistry CU.

Research group : Dr. Nabanita Chakroborty, Dr. Avik Choudhury, Dr. Sudeshna Sen Roy, Dr. Nilofer Khatoon (PDF); Dr. Tania Chakraborty, Panchali Bhattacharya, Dipannita Pariel, Gour Gopal Satpati, Nirupam Barman, Piya Roy Chaudhury, Pryianka Mukherjee, Anindita Singha Roy, Sarban Sengupta, Prakash Chandra Garai, Rahul Bose, Camelia Nandi. Dr. Arpita Mukhopadhyay (PDF and WOS).

Dr. Krishnendu Acharya (Professor)

Born on 16th December 1969 in the suburbs of Kanthi in Purba Midnapur district in West Bengal, Prof. Acharya pursued and obtained his M.Sc. degree in Botany at University of Calcutta with distinction in 1992. He then completed M.Tech in Biotechnology from Jadavpur University (1995) in first class, thereafter pursuing research work entitled "Antithrombotic Effect of Nitric Oxide (NO)/Endothelium Derived Relaxing Factor (EDRF)" for which he was awarded Ph.D. from Jadavpur University in 1999.

West Bengal Education Service appointed Prof. Acharya as Lecturer of Botany in Darjeeling Government College in 1999, earning the love and respect of his students, which he holds to this date. During 2004, he joined University of Calcutta as Lecturer of Botany, soon acceding to the positions of Readership (2006), Associate Professorship (2009) and Professorship in 2012. He teaches Molecular and Applied Mycology and Plant Pathology at the university.

All through his professional tenure, Prof. Acharya has been invited to be part of boards and societies where he holds positions of responsibility. He acted as a member of the executive council of the Indian Mycological Society; the Departmental Technical Committee, Department of Biotechnology, Government of West Bengal; the Faculty Council, University of Calcutta and scientific advisory committee (Medicinal plant garden and mushrrom project), Ramakrisna Mission Ashrama, Narendrapur. He actively participates in learned societies and professional bodies like SBA, ISCA, SBCI, BSD and SEBA. He is a Fellow of International College of Nutrition, Canada. His illustrious career has been embellished with prestigious awards like Patel Memorial Award (World Congress of Clinical Nutrition, Egypt, 2010) and Global Achievement in the Field of Phyllosphere Biology (International Conference on Phyllosphere Biology, Noida, 2012). Prof. Acharya is an Academic Editor of *PLoS One* and Associate Editor of the *Journal of Environment and Sociobiology*.He has also participated as a resource person for different national and international seminars/ refresher courses.

Research Interests :

Inventorisation of Macrofungal wealth: Macrofungi can be defined to possess hypogeous or epigeous distinctive fruiting bodies, which can be seen with the unaided eye and be picked by hand. According to recent estimation, only 140,000 species produce fruiting bodies of sufficient size and suitable structure to be considered as mushrooms among approximately 3 million fungi. Till date, we know only 14,000 described mushroom species which by far accounts for 10% of the total estimated mushroom diversity.

In the frame of the inventory of the Indian macrofungi, the state of West Bengal is under thorough investigation. Relentless inventorisation by Prof. Acharya and his team for the last decade has helped to unveil a significant amount of macrofungal diversity of the state, with more than two thousand specimens in the Calcutta University Herbarium (CUH), several of which are newly reported for India as well as some that are new to science. Some of the newly described species from his laboratory includes *Volvariella pusilla* var. *minuta* and *Marasmius midnapurensis* etc. The team is working on a few more species soon to be reported. Prof. Acharya's team is building up on the already inventorised diversity employing morpho-taxonomic identification of the macrofungal species, as well as molecular identification based on Internal Transcribed Spacer sequence in combination with nuclear ribosomal large subunit (nLSU) rDNA.

Exploration of Sanative and Nourishing Efficacy of Mushroom : Since 5000 BC mushrooms have been used as food, medicine, hallucinogens, healing agents and in religious rituals. Nature, being the master chemist, has bestowed its biggest bounty of bioactive compounds upon mushrooms, making them the most consistent and dependable source for new drugs. Prof. Acharya and his team has evaluated many traditionally consumed mushrooms (more than 30 species) from West Bengal for their nutritional value and bioactivity with respect to anti-cancer, immune-modulation, anti-diabetic, cardio-protective, hepato-protective, antimicrobial and anti-oxidant properties. Besides, different chromatographic techniques are being employed to characterize the bioactive chemicals. Further studies are going on to enrich the field of medicine using the unique source of natural compounds, that being mushrooms.

Boosting of innate immunity in plants via nitric oxide signaling : Plants are extremely resilient, facing various biological and environmental stresses in their lifetimes. Thus, prone to numerous diseases, they combat with their innate immunity, but on some occasions, they need a boost in immunity externally. Prof. Acharya and his team works on the signaling role of nitric oxide in SAR and ISR in plants employing non-conventional and ecologically friendly approach, like the application of various biotic elicitors and abiotic elicitors, for plant protection. They have also shown that the NO activation acts at the transcription level, being associated with the upregulation of defense related genes, higher accumulation of defense enzymes and total phenolics. Further investigations are focused on the role of NO during host-pathogen interaction, which will provide a better understanding of the plant defense system.

Myco-nanotechnology : Since the very ingress of nanotechnology, it has been considered a revolution in the technological world and it has had enormous impact on the society, economy and life in general. This area of science has tremendously influenced many scientific and environmental sectors such as energy, chemical, medicine, information technology, electronics, environment application, security, space, drug and gene delivery, biotechnology etc. In the recent years, 'green' syntheses of the nanoparticles had received major attention in the rapidly growing area of nanoscience and nanotechnology. Prof. Acharya's interests mainly focuses on the synthesis of different nanoparticles through eco-friendly, non-toxic, cost effective green routes and their biological applications. Prof. Acharya and his team have already shown that bioactive nanoparticles can be effectively biosynthesized and are exploring the field further.

Prof. Acharya has already executed 6 research projects and presently his scholars are working on 2 ongoing projects under his supervision. His success reflects from the patents (1 granted + 1 applied), numerous GenBank submissions and protein structure registrations in Protein Model Data Base (PMDB).

Research Group :

Dr. Rupa Acharya; Dr. Surjit Sen; Dr. Chandan Kumar Maiti; Dr. Manjula Rai; Dr. Gunjan Biswas; Dr. Soumya Chatterjee; Dr. Subrata Giri; Dr. Ananya Chatterjee; Prakash Pradhan; Namrata Shanu Gupta; Joy Sarkar; Nilanjan Chakroborty; Swarnendu Chandra; Arun Kumar Dutta; Somanjana Khatua; Soumitra Paloi; Payel Mitra; Adhiraj Dasgupta and Jit Sarkar.

Publications (Journal, Review, Book)	: 194
Articles	: 168
Reviews & Book chapters	: 16
Books	: 2
Patent	: 2 (One applied)

Dr. Rita Kundu (Professor)

Date of Birth : 18.01.1965

Date of Joining : 09.07.2004

R. Kundu has graduated from Bethune College in 1985 and completed her postgraduate degree from this Department in 1987 with specialization in Cell Biology and Genetics. She then joined for her doctoral work under Prof. Sibdas Ghosh as a CSIR-NET fellow in December, 1990. She worked on deregulation of mitosis in plants and went to German Cancer Research Institute (DKFZ) in Heidelberg (in 1995), as a guest scientist and worked there on animal cell lines to compare the initiation of mitosis in both the systems. She submitted her work in January, 1997. She then joined in West Bengal Education Service and posted as a lecturer in Lady Brabourne College in September, 1997. She was awarded Ph.D. degree in 1999. In 2004 she joined this Department as a lecturer and till date she is involved in post-graduate teaching and research.

Major areas in Research :

i) *Evaluation of plant resources for induction of cell death in Human cervical cancer cells:* Among different types of cancer, cervical cancer is most prevalent among the women worldwide especially in India, where the prevalence of cervical cancer is surprisingly high. The disease is caused by high risk papilloma virus strain (HPV16/18). HPV genome integrates with the epithelial cell genome and produces E6 and E7, two viral proteins which abrogate the normal regulatory functions of pRB and p53. This HPV infection is transmitted through contact. Currently a population of more than 366 million women of India (age group 15 years and more) is at the risk of developing the disease. In India every year 134420 women are diagnosed with the disease and 72825 die from this cancer. The available treatments are associated with serious side effects like nausea, vomiting, bleeding, fatigue, hair loss, cognitive impairment, gastrointestinal disorders, infertility and many others. The synthetic drugs exhibit nonselective cytotoxicity, leading to multiple organ toxicity, including hemopoetic suppression and immunotoxicity.

In this context natural products, derived from plants, marine organisms and microorganisms have drawn attentions of many scientists. According to WHO, 80% of world's population especially in developing countries rely on plant derived medicines.

Programmed cell death is a crucial mechanism to regulate cell homeostasis. Absence of cell death leads to unregulated cell proliferation giving rise to neoplastic growth. Therefore the targets of today's cancer therapy have been to restore the endogenous cell death mechanism in cancer cell, so that cells defective in their metabolism can be eliminated. Cell death can occur by several distinct mechanisms, such as apoptosis, autophagy, necrosis etc.

To evaluate the anti-proliferative potential of natural products (plants and algae), a panel of three human cervical cancer cell lines, HeLa (HPVI8), SiHa (HPV16) and C33 (HPV negative) were selected. The cytotoxicity of the plants has been compared with normal fibroblast (NIH3T3) cells. Apoptosis inducing capabilities of those potent cytotoxic fraction were evaluated by flow cytometric method (Annexin V/PI) and DNA laddering assay. Gene expressinof several anti and proapoptotic and autophagic proteins were studied at the transcriptional and translational levels by RT-PCR and western blotting. Occurrence of autophagy was determined by co-localization of autophagic & lysosomal proteins by indirect immunofluorescence.

ii) *Screening of potential candidate plant for phytoremediation:*

Heavy metal contamination is one of most pressing threat to the environment as well as to human health. Due to rapid urbanization and unplanned industrialization and indiscriminate use of chemicals (as fertilizers and pesticides) arable lands are being contaminated with various metals. This may further contaminate the crop plants and ground water and thus may enter into the food chain, affecting human health. Among these metals lead, cadmium, chromium and arsenic are not essential to biological systems, rather they have a deleterious effects on plant growth and development. Therefore it is necessary to remediate the soil from the contaminants. Studies indicate that a number of plant species have the capacity to accumulate and detoxify several toxic heavy metals including lead, chromium and cadmium. This capability can be used to remediate contaminated soils. A large number of reports are available regarding the screening of several plant species for their ability to tolerate and accumulate heavy metals under laboratory conditions. However, few studies have investigated the accumulation/detoxification capabilities of native plants under field conditions. Screening of Pb, Cd and Cr contaminated sites were undertaken to identify the metal tolerant native plants. Exploration of its phytoremedial potential was studied by the assessment of metal uptake by the roots and shoots. Tolerance potential was assayed by monitoring different biochemical parameters, such as, free proline content, NPSH content, lipid peroxidation and activity of different antioxidant enzymes (GPX, APX, Catalase, GR). Using RAPD primers it is possible to detect genotoxic effects of these metals by the PCR techniques. Role of ABC transporter in metal (Pb) detoxification were studied by semi Q-RT-PCR.

iii) *Evaluation of cadmium tolerance to some selected rice cultivars:*

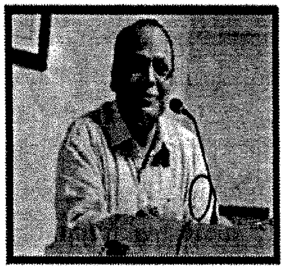
Cadmium is an extremely phytotoxic and mobile element, so it is absorbed along with the soil water and translocated to the aerial parts of the plants. High concentration of Cd in rice and drinking water causes itai-itai disease. Primary objective of this study, was to identify the cultivars with a lesser Cd accumulation capacity, and reducing the possible dietary threat. Selected rice cultivars were grown in the laboratory and treated with moderate doses of cadmium. Different biochemical parameters were studied to evaluate the tolerance potential of the cultivars. Presently we are engaged in studying the expression of some relevant genes (PCs, Nramp and Rbcs) by RT-PCR under cadmium stress.

Research Projects : 04

Total no. of publication : 17

Research Group : Dr. Rai Kamal Pal; Dr. Suparna Kar Chowdhury (nee Pal); Aniket Bhattacharya; Subhabrata Paul; Arpita Mondal; Indira Majumder; Sayantani Ghosh Dastidar.

Dr. Binay Chaubey (Associate Professor)



Date of Birth : 23.01.1969

Date of Joining : 14.03.2007

Teaching: Microbiology, Microbial Biotechnology, Virology, Medical Biotechnology

Awards and Honours :

Poster Award at ICGEB-IUBMB workshop on Human RNA Viruses at ICGEB, New Delhi, 2010.

National Scholarship from Ministry of Human Resource and Development, Govt. of India 1990.

Krishna Lal De Gold Medal for Best B.Sc. (Hons.) student, Scottish Church College, Kolkata, 1989.

Mrs. P.R. Das Memorial Gold Medal and Dr. J Sen Memorial Prize for first position in Botany (hons), Scottish Church College, Kolkata, 1989.

Research Interest :

JRF: June 1992-August 1994, School of Biochemical Engineering, Institute of Technology, BHU, Varanasi.

Ph.D.: Department of Molecular Biology and Biochemistry, Guru Nanak Dev University, Amritsar.

Lecturer and Senior Lecturer: 1994-2006 Department of Microbiology, Guru Nanak Dev University.

Post-Doctoral Training: March 2003- Sept 2006, Department of Biochemistry, University of Medicine and Dentistry, Rutgers, New Jersey, USA.

Reader: March-December 2008, Department of Botany, BHU, Varanasi.

Reader and Associate Professor: March 2007 Department of Botany, CU, Kolkata.

Present: Experienced Scientist, Department of Molecular Virology, Intercollegiate Faculty of Biotechnology, University of Gdansk, Gdansk, Poland (From Feb 2014 to May 2016).

After joining the department DrChaubeyhas established Virus Research laboratory having facilities for human tissue culture, virus culture, proteomics, Real-Time PCR, RNAi, High throughput *in-vitro* screening of anti-viral compounds etc.

Hepatitis Research :

Hepatitis C Virus (HCV) is the major cause of chronic active hepatitis, hepatocellular carcinoma and liver cirrhosis. There is no vaccine available against this virus. The current standard therapy has shown some promising results, but it has limited efficacy, resistance problems, poor tolerability and high cost. The focus of our research is to inhibit viral replication using siRNA. This is a promising approach, which can overcome the limitations associated with the existing therapy. We will deliver multiple short hairpin RNAs (shRNA) targeted against both, host cell factors and the conserved domains of viral non-translated regions and nonstructural genes through self-inactivatinglentiviral vectors.

HIV Research :

Among HIV infected people mitochondrial dysfunction in hepatocytes and other HIV infected cells is a leading cause of cellular death. Several viral proteins such as HIV-1 Vpr and Gag interact with and alter organization of mitochondrial membrane which may impair oxidative phosphorylation and electron transport mechanisms resulting in depletion of cellular ATP pool and accumulation of reactive oxygen species. Presence of HIV-1 RNA has also been reported in mitochondrial compartment. The rationale for this accumulation is not well understood. These questions need to be addressed so that new drugs can be designed in order to contain the viral propagation as well as sustain the mitochondrial integrity. This will significantly improvethe management and control of AIDS.

Screening of Indigenous Medicinal Plants for Anti-HIV Property :

India harbors a vast repertoire of indigenous medicinal plants. But very few studies have been done on their medicinal property against HIV and HCV. Several medicinal plants have been reported to have anti-HIV activity. We are trying to evaluate their *in-vitro* anti HIV-1 RT and anti HCV NS5B activity. This work is expected to provide a platform for high throughput screening of antiviral compounds where in future more compounds can be screened.

At present Dr. Chaubey is working as Experienced Scientist in the European Union Program for Health in Department of Molecular Virology, Intercollegiate Faculty of Biotechnology, University of Gdansk, Poland. His major responsibility during this tenure is to understand cell to cell transmission of Hepatitis C Virus.

Project implemented : 04

Publication : 13

Research Group : Anirban Mandal, Krishna Kumar Ganta, Surajlata Konsam

Dr. Mousumi Poddar Sarkar (Associate Professor)

Dr. M.P. Sarkar is serving her Alma mater since 2009; graduated from Presidency College (1981-84), Kolkata; did her doctoral research at Indian Statistical Institute, Kolkata (Ph.D. from University of Calcutta), having first class career all throughout. She initiated her research career with a publication in Nature, 1990. She belongs to a school which had introduced pheromone research in India under the leadership of renowned Pheromonologist Prof. R.L. Brahmachary of Indian Statistical Institute and late Prof. J. Dutta of Bose institute, Kolkata. Unraveling the fact of occurrence of 2-acetyl-1-pyrroline, the elusive fragrant molecule of Indian Basmati rice in the Marking Fluid of Bengal tiger for territorial demarcation and home range maintenance has been highly acclaimed in etho-chemistry research scenario across the world. Unwinding the tale of adaptive strategy of 'high altitude Eastern Himalayan mosses by volatile Oxylipin signaling molecule'—is the recent achievement from this laboratory. She has a passion for field work at different Ecological terrain and likes to concentrate on integrative biology with interdisciplinary approach. In her research arena she believes in three "F"s—FOREST, FORMULATE and FIGURE OUT.

Research Interest :

- "Semiochemistry" Isolation, identification of volatile and non-volatile compounds of Plant and Animal origin.
- Lipids & Lipidomics of plant and animal world.
- Chemistry and metabolic pathways of signaling molecules associated with intra & inter individual communication in mammalian system and also with inter-specific communication in plant system.
- Ethology & Ethogenomics of mammalian system especially in big cats.
- MUP proteins and VNO associated transport in mammalian system.
- Oxylipin molecules of Plants under abiotic stress.
- Elemental dynamicity in lower group of plants especially bryophytes.
- Molecular phylogeny of lower group of plants.
- Identification of chemotaxonomic marker of plant system and animal system
- Ultrataxonomy, ultrabiometry and Evolutionary biology of mammalian system.

Research & Teaching :

- Cell Biology, Molecular Biology and Genetics, Biochemistry (metabolism & quantitative Biochemistry), Microbiology and Instrumentation.
- 1995-1997 : Research Associate, CSIR, Govt. of India.
- 1997-2009 : Served Surendranath College, Kolkata as Lecturer/ Reader 2009-till date: Reader/Assoc. Prof., Deptt. of Botany, University of Calcutta.
- 2009—till date : Associate Professor, Department of Botany, University of Calcutta

Awards

- Nominated by Inidian National Science Academy under Bilateral Exchange Programme, 2012 for teaching and research assignment at Hungary Academy of Science, Budapest and Eötvos Lorand University and Eszterhazy College, Eger, Hungary.
- Indian mentor of US-research intern under Indo-US Sc.& Tech. Forum, Fulbright House, New Delhi, 2011.

  Awarded with Full Financial Assistance by Cornell University, USA to present research findings during the tenure of Research Associate of CSIR (Indian Statistical institute, Kolkata), 1997.

  National Scholarship, Govt. of India, 1985-86.

  8th rank in National Diploma in Russian Language (All India Institute of Russian Language, New Delhi), 1985.
- National Merit Scholarship and Prize, Govt. of India, 1979.

Research Projects : 04

Research Group :

Paramaa Raha; Souvik Mitra; Biswatosh Ghosh; Sumedha Roychowdhury; Sandipan Ray; Anushya Biswas.

Dr. Karabi Datta, FNAAS, MNASc (Reader)

Date of Joining : June 16, 2009

Current Position :

Reader, Department of Botany, University of Calcutta, Coordinator, DBT-Programme support at University of Calcutta

Former Position :

Senior Scientist, Plant Biotechnologist (1995-2005) at International Rice Research Institute (IRRI), Metro Manila, Philippines; Research Scientist at International Center for Genetic Engineering and Biotechnology (ICGEB), New Delhi (1993); Senior Scientist at Swiss Federal Institute of Plant Sciences (ETH), Zurich, Switzerland (1988-1993)

Field of Specialization :

Plant Molecular Biology and Biotechnology (Molecular breeding, Transgenic research, Haploidy, Crop improvement)

Awards and Honours :

- Elected Fellow of National Academy of Agricultural Sciences (FNAAS), 2012
- Elected Member of the National Academy of Sciences (MNASc), 2011
- Elected Member of Plant Tissue Culture Association (PTCA), 2014
- Best Science paper award by CGIAR (Consultative Group of International Agriculture Research) in 2004 on Iron and Zinc improvement in Rice, published in Plant Science (2003).

Special Attainments in Research :

Pioneering contribution in establishment of genetic transformation using protoplast system in indica rice (Bio/Technology, 1990). Demonstrated marker free transgenic event and non-antibiotic based (*pmi*) selection system in rice using *Agro* and biolistic method of transformation (Plant Biotechnol. J, 2003; MGG, 2005; Plant Biotechnol J. 2006; Plant Biotechnol J., 2003; Curr. Sci. 2006). Endosperm specific promoter driven carotenoids biosynthesis in indica rice demonstrated and developed DH homozygous plants (Plant Biotechnol. J, 2003; Curr. Sci.2006; PLoS ONE 2014). High iron rice developed (Plant Science, 2003; Food Chemistry, 2013). Enhanced sheath blight resistance in rice demonstrated (Bio/Technology, 1995; TAG, 1999, 2000; Plant Sci., 2001; MPP, 2013). Bacterial blight resistant rice developed by using *Xa21* gene and field evaluated (TAG, 2000; Trends in Biosciences, 2008). Gene pyramiding of *Xa*, *Bt* and pathogenesis related protein gene, *chitinase* has been demonstrated in rice (TAG, 2002). Hybrid insect resistant Bt rice developed and field evaluated (Plant Cell Reports 1999; Nature Biotechnology, 2000). Abiotic stress tolerance by overexpression of *DREB* genes and *Rab16A* has been demonstrated in rice (Plant Biotechnol. J., 2012; Plant Signaling and Behavior, 2012). RNAi mediated silencing technology for enhancement of nutritional bioavailability from rice has been demonstrated (PloS One, 2013; Rice, 2013). Stable genetic transformation of Jute has been established (Plant Cell Tissue Organ Culture, 2014).

No. of Project Implemented — 4

Research Group :

Dr. Moumita Ganguly, Dr. Soumitra Paul, Dr. Nusrat Ali, Dr. Dipak Gayen, Mr. Kutubuddin Ali Molla, Mr. Subhasis Karmakar, Mr. Prosanta Saha, Ms. Priyanka Sen, Ms. Satabdi Ghosh, Mr. Shuvobroto Majumder, Mr. Subhrajyoti Ghosh, Ms. Sananda Bhattacharya, Mr. Aritra Karmakar, Ms. Shinjini Sengupta, Mr. Chirabrata Sarkar, Mr. Kaushik Das, Dr. Sailendranath Sarkar

Dr. Maumita Bandyopadhyay (Assistant Professor), Department of Botany, Univ. of Calcutta

Brief Resume :

Born in Jaipur, Rajasthan, Maumita finished her schooling in Kolkata, from St. John's Diocesan Girls Higher Secondary School and Modern High School. After Higher Secondary, she enrolled in the Botany Honours course in Lady Brabourne College, with Chemistry and Zoology, as the pass subjects, and completed the course in 1996. She completed her Post Graduate studies from the Department of Botany, University of Calcutta, completing the course in 1998, with Cell Biology, Molecular Genetics and Plant Tissue Culture as her specialization subject. She was awarded the Dr. J. Chakraborty Memorial Award for obtaining the first position in the MSc course, by the Botanical Society of Bengal. In the same year she qualified the CSIR NET JRF examination, and joined the laboratory of Prof. Sumita Jha, commencing her doctoral research. The topic of her thesis was "*Tissue Culture and* Agrobacterium *Mediated Transformation in Medicinal Plants*". During the tenure of her doctoral research, she had the opportunity to visit the laboratory of Dr. David Tepfer, INRA, Versailles, France, in 2003-2004, as a part of a technology transfer project funded by IFCPAR, where she was trained on a host of plant vector construction, and plant transformation techniques. She was awarded PhD by the University of Calcutta in 2005. In July 2006, she joined the Department of Botany, University of Calcutta, as Lecturer.

Teaching Interests :

Her teaching interests include Plant Genetics and Genomics, Plant Biotechnology, Plant Cell and Molecular Biology and Cryptogamic Botany. As an adjunct faculty of the Department of Genetics, she teaches Basic Genetics, and Developmental Genetics of Plants, along with Plant Biotechnology.

Research Interests :

Her research areas include Molecular Cytogenetics of Plants and Plant Biotechnology. She is interested in studying the cytological and genetic variation among related groups of plants, and to understand the evolutionary implications of such variability using Molecular Phylogenetics. Presently, she is also working on the DNA damage induced by environmental pollutants and their potential transgenerational effects in plants. At present, 5 students are registered for Ph.D. under her supervision, working on different aspects of Plant Genetics and Plant Biotechnology.

No. of Project Implemented — 3

Research group—Mou Datta, Sreetama Bhadra, Debalina Das, Abhishek Sadhu, Indrani Manna.

Dr. Surekha Kundu

Designation : Assistant Professor, Department of Botany, University of Calcutta.

Academic qualification : M.Sc. in Botany (Gold Medalist), University of Calcutta, 1993. Ph.D. in Plant Molecular Biology and Biotechnology, Bose Institute, Kolkata, 2002.

University of California, Los Angeles, USA. Post doctoral fellow, 2002-2006, Molecular Cell and Developmental Biology.

University of California, Los Angeles, USA. Visiting Fellow 1.7.08-12.1.09, Molecular Cell and Developmental Biology.

Honors/Awards :

Gold Medallist, M.Sc. (Botany), University College of Science, University of Calcutta, Rank: First in First Class, June, 1993.

Awarded Hiralal Chakraborty Award by Botanical Society of West Bengal, 1993.

Nominated for President of India Sankar Dayal Sharma Gold Medal 1993 for all round achievements (Academic and extracurricular).

Qualified for the NET (CSIR/UGC) fellowship for Ph.D., June, 1993.

Academic Experience :

Ph.D., Bose Institute, Kolkata, 2002, subject: Plant Molecular Biology and Biotechnology.

Post Doctoral Research, University of California, Los Angeles, USA, 2002-2006. Subject: Molecular Cell and Developmental Biology.

Visiting Fellow: Univ. of California, Los Angeles, USA. 1.7.08-12.1.09, Field of Plant Molecular Cell and Developmental Biology.

University of Calcutta, Department of Botany, Assistant Professor, 26.12.06 to present. Subject of research: Gene regulation, transgenic research, nanotechnology, drug delivery.

Research Activities :

Understanding gene regulation in response to stress, both biotic and abiotic, in different crop plants and elucidation of signal transduction pathways in response to stress.

Development of multiple-stress resistant transgenic crop lines using stress related genes; transgenic rice, tomato, sesame, tobacco, chilli and mustard.

Finding new antimicrobial agents using economically important fungi and their application in the field of crop protection and medicine.

Vector mediated drug delivery into human cancer cell lines.

Research Group :

Supriyo Chowdhury; Arpita Basu; Sarmistha Ray; Somnath Mondal; Madhusree Halder; Susanta Chaterjee; Subarna Ghosh; Kathakali Das; Dr. Nicky Singh (PDF)

Dr. Debabrata Maity (Assistant Professor)

Date of Birth – 30.06.1976

Date of Joining – 08.06.2009

D. Maity completed his B.Sc. (Hons.) and M.Sc. degree (with special paper Taxonomy of Angiosperms) from University of Kalyani in the years 1996 and 1998 respectively and ranked First in First Class in both the examinations. After completion of M.Sc. he has received fellowship from Ministry of Environment & Forests, Govt. of India and joined Botanical Survey of India, Sikkim Himalayan Circle, Gangtok, Sikkim in 1999 under the project "Assessment of Plant Diversity of Kanchenjunga Biosphere Reserve, Sikkim". Simultaneously he had been awarded Ph.D. from University of Kalyani in 2005. Dr. Maity joined the Department as Assistant Professor in 2009 and till date he is continuing the post-graduate teaching and research.

Research Interest

One prominent component of the research program is to investigate the species diversity and conservation of Eastern Himalaya. These activities complement floristic research on plant communities that inhabit different climatic regimes of the Himalaya including extreme ecological situation in cold desert at high altitude. The aim of the work is to elucidate the biogeographic relationships between Indian Himalaya and Tibet and Bhutan Himalaya. The Taxonomy and Biosystematic laboratory and Herbarium (CUH) also supports students that are interested in the natural history of the Himalayan flora, with emphasis on rare and threatened species. The research group investigates the reconstruction of phylogenetic relationships, the evolution of morphological characters, and the influence of geology and ecology on species in space and time. I have maintained long-term interest in the flora of the highlands in Eastern Himalaya, where I have participated and led numerous collecting expeditions to remote locations in effort to provide baseline plant biodiversity information for these highly endemic ecosystems. *Research interests* also lie with the revision of different plant groups (genus and family) in Indian context. Investigation on different palynological aspects of high altitude plants and understanding the pollination behavior, species–pollinator relationship, floral architecture, etc. are also carried out.

Current research interests also center on the investigation of the vegetative anatomy of different seed plant groups–specifically of the angiosperms. Special emphasis is given to illustrate in detail the foliar architectural pattern in different angiosperm higher taxa and their taxonomic and evolutionary significance. Very recently the evolutionary consequences of 'split–lateral' nodal structure are formulated.

Ethnobotanical exploration in the extreme remote places of Sikkim and West Bengal is also continuing with the aim to document the Indigenous Technical Knowledge (ITK) of the region.

Dr. D. Maity is continuing his research on Eastern Himalayan Flora for more than 15 years and published more than 60 research papers in different reputed international journals. During this tenure he has described several new taxa including a genus, few species, etc.; reported many species as new record to different phytogeographical regions. He has also contributed in the field of nomenclatural changes and typification of different angiospermic taxa. One of his work is cited in the International Code of Nomenclature for Algae, Fungi and Plants (ICN-Melbourne Code, Chapter 3: Section 3 : Article 22.3 : Ex.6). He has described many new stomatal structures in two different angiosperm species with their probable phylogenetic significance. At present, five students are registered for Ph. D. under his supervision, working in different disciplines of Angiosperm Taxonomy and Biosystematics.

He was the member of international expert committee (2010) of Food and Agriculture Organisation of United Nations (FAO) in the project "A Strategic Road Map for Developing the Medicinal and Aromatic Plants Sectors in Bhutan" (Study conducted under: "Organic Production of Under-utilized Medicinal, Aromatic and Natural Dye Plants Programme for Sustainable Livelihoods in South Asia").

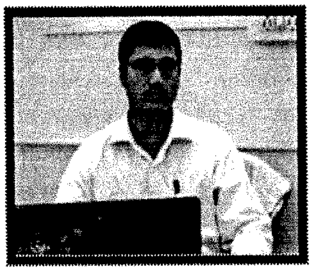
No. of Project Implemented : 02

Total no. of Publication : 61

Book : 02

Research Group : Dr. Manasi Mandal (Post Doctoral Fellow); Sonia Mitra; Gopal Krishna; Bappaditya Saha; Sentu K. Dey; Moumita Das Das; Pamela Saha; Suchandrima Siddhanta; Subhojit Paul.

Dr. Sudipta Ray, Assistant Professor, Department of Botany, University of Calcutta



Teaching : Plant Genetics and Genomics in the Department of Botany and Plant Biotechnology, Molecular Biology, Regulation of gene expression in the Department of Genetics, University of Calcutta.

Brief resume : Completed M Sc in Botany from University of Calcutta, qualified CSIR-NET and done my PhD from Bose Institute Kolkata in 2009. I have joined the Department of Botany University of Calcutta as Assistant Professor in the same year. My research interest encompasses plant abiotic stress tolerance and ways to achieve the same. Actively involved in teaching as well as research with a number of Ph.D. students under my guidance

Award Received : BOYSCAST FELLOWSHIP DST, in 2010-2011 as visiting fellow in the University of Nevada, RENO, USA.

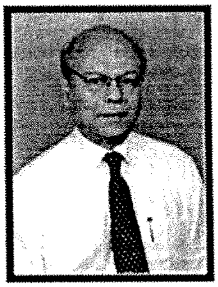
Research Interests :

One of the fundamental questions in plant biology is how plants sense and respond to environmental stresses. A thorough understanding of mechanisms by which plants respond to stresses will pave the way to engineer plants that are capable of growing well under adverse environmental conditions. Plants are routinely subjected to a combination of different abiotic stresses. Of all the abiotic stresses that decrease crop productivity, drought is the most devastating one. Drought is a serious agronomic problem and the single greatest factor contributing to crop yield loss in the world. This problem may be alleviated by developing crops that are well adapted to dry-land environments. *Sorghum* which has been sequenced completely, is one of the most drought-tolerant grain crops and is an excellent crop model for evaluating mechanisms of drought tolerance. Plants activate a diverse set of physiological responses that range from altering membrane composition, development and cellular metabolism that allow them to withstand this stress. Accumulation of the late embryogenesis abundant (LEA) proteins is associated with tolerance to water-related stress. Dehydrins have a key role in protecting plants from dehydration stress. A focus on molecular, physiological and metabolic aspects of stresses is vital to facilitate the development of crops with enhanced tolerance to field conditions. Our interest is to dissect out the role of these stresses induced proteins by molecular, genetic, biochemical and bioinformatics tools.

Project implemented : 01

Total no. of Publication : 07

Research Group : Tanmoy Haldar; Tanushree Agarwal; Ekta Bhattacharyaa; Chandrima Chakraborty.



Dr. Swapan K. Datta, FNA, FNAAS, FNASc, TWAS

Date of Joining as Rashbehari Ghosh Chair Professor on 5 April 2005, Ex-DDG (CS) at ICAR, New Delhi. Presently working as Pro-Vice-Chanceller, Visva-Bharati University, Santiniketan.

Teaching :

Date of Birth : 28 Jan 1953

Lecturer at Ramakrishna Mission Vivekananda Centenary College (1976-1979)

Lecturer and Reader at Visva-Bharati University (1979-1989)

Rashbehari Ghosh Chair Professor at Univ of Calcutta (2005-)

In addition, Dr. Datta served at multicultural and International R&D environments such as UC-Davis (USA), ETH-Zurich (Switzerland), IRG (Germany), and IRRI (Philippines) attached with respective Universities.

Research Interest and Group : Plant Biology and Biotechnology (Molecular Breeding, Genetics, Transgenic Research, Haploidy, Crop Improvement, International Agriculture Policy); Global IP management & Biotech-Regulatory System

Awards and Honours :

- Elected Fellow of The World Academy of Science in 2014 (TWAS)
- Elected Fellow of Indian National Science Academy in 2014 (FNA)

- Elected Fellow of National Academy of Agricultural Sciences in 2005 (FNAAS)
- Elected Fellow of National Academy of Sciences in 2006 (FNASc)
- Elected Fellow of West Bengal Science and Technology Award in 2014 (WBSTA)
- Awarded DAAD Fellowship, Germany (1985-1986)
- Awarded FMI Fellowship, Switzerland (1987)
- Awarded ETH- Senior Scientist (Group Leader) at Zurich (1987-1993)
- TATA Innovation Fellow in 2007-2009, DBT, Govt. of India
- Recipient of Panchanan Maheshwari Medal in 2006 for significant contributions in Experimental Embryology and Plant Biotechnology
- Recipient of SM Sircar Memorial lecture award in 2008 at Kolkata by the BSB
- Recipient of Paul Johnnes Brouhl Memorial Medal (2009).
- Awarded Indian Science Congress Platinum Jubilee lecture in 2010
- President, Agriculture and Forestry Science, 101 session of Indian Science Congress Association
- CGIAR Science award for the significant research contributions on high iron rice.
- Member (Advisor) ILRI, Washington, USA
- Member (Former) International Plant Tissue Culture and Biotechnology
- Member, Board of Directors, BCIL (Biotech Consortium India Ltd.), New Delhi
- Chairman, Germplasm Registration Committee, Min of Agriculture, GOI
- Chairman, Crop Standard, Notification, and release of varieties for Agricultural Crops, GOI
- Chairman, Directorate of Information and Publications of Agriculture, GOI
- Chairman, Agricultural Systems and Management Sectional Committee, FAD22 of BIS
- Member, GEAC (Genetic Engineering Approval Committee, New Delhi, Min of MoEF, GOI
- Member (Former) RCGM (Review Committee on Genetic Manipulation), New Delhi, GOI
- Member, Protection of Plant Varieties and Farmers' Right Authority, GOI
- President (Former) Society of Plant Physiology, New Delhi, India
- President, Indian Society for Plant Genetic Resources, New Delhi, India
- President, Plant Physiology Forum, Kolkata, WB, India

Special Research attainments : Developed pioneering work on isolated microspore embryogenesis in cereals;

First demonstration of genetically engineered homozygous indica rice published in Nature Biotechnology (1990), and followed up work in field evaluation of genetically improved rice for insect, disease resistance and nutrition improvement. Published research papers in Science, Nature Biotechnology, Nature, TAG, MGG, Annals of Botany, Phytochemistry, Plant J & Plant Biotech J, Crop Science, Plant Cell Reports, Crop Science and Molecular Breeding etc.

Published 120+ research papers.

Published in Science, 2013 (Co-Authors with Distinguished Global Scientists including two Nobel Laureates).

Supervised 30 + PhD students and mentored many PDFs from different countries including Bangladesh, India, China, Germany, Korea, Myanmar, Pakistan, Portugal, Switzerland, Philippines, USA and Vietnam.

Other relevant information (Honours/recognition):

Chairman, Editorial board: Indian Agricultural Sciences, New Delhi

Associate Editor: International Journal of Agriculture and Food Security (UK)

Associate Editor: GM Crops **(Landes Publication)**

Associate Editor (Former): Transgenic Research (Netherlands) Plant Biotechnology (Japan) and Molecular Breeding (Netherlands)

Publication(with Karabi Datta) : 117

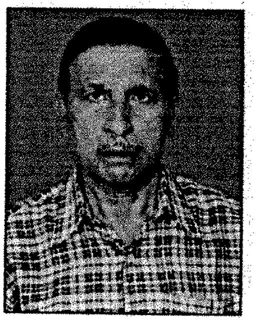
Other faculties from website – www.caluniv.ac.in

Non Teaching Staff

Office Staff Members

Name – **MR. RAMAYAN YADAV**
Date of Birth – 18/08/1977
Date of Joining – 02/08/2004
Current Designation –
JUNIOR ASSISTANT-CUM-TYPIST

Name – **MR. VINOD KUMAR**
Date of Birth – 11/04/1958
Date of Joining – 26/04/1989
Current Designation –
JUNIOR ASSISTANT



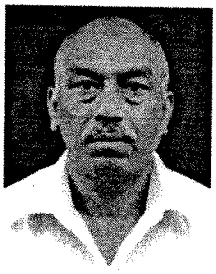
Name – **MR. RAMCHANDRA SINGH**
Date of Birth – 15/07/1956
Date of Joining – 18/11/1977
Current Designation – SENIOR PEON

General Laboratory Staff Members

Name – **MRS. SOMA GUPTA**
Date of Birth – 24/05/1967
Date of Joining – 13/01/1997
Current Designation –
TECHNICAL ASSISTANT, GR.- I

Name – **MR. KALYAN BANERJEE**
Date of Birth – 15/08/1955
Date of Joining – 03/06/1974
Current Designation –
LABORATORY ATTENDANT, GR.- II

Name – **MRS. SUPARNA BANIK**
Date of Birth – 13/12/1976
Date of Joining – 18/10/2005
Current Designation –
TECHNICAL ASSISTANT, GR.- II

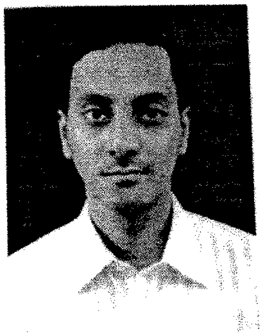


Name – **MR. SAHEB ALI SARDAR**
Date of Birth – 26/05/1960
Date of Joining – 18/05/1994
Current Designation –
LABORATORY ATTENDANT, GR.- II

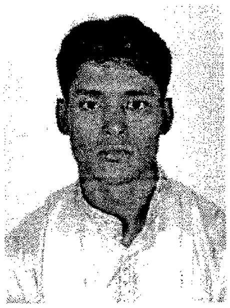
Name – **MR. SANDIP KUMAR PAUL**
Date of Birth – 04/12/1978
Date of Joining – 14/03/2007
Current Designation –
TECHNICAL ASSISTANT, GR.- II

Name – **MR. RANJIT DAS**
Date of Birth – 19/01/1961
Date of Joining – 29/03/1995
Current Designation –
LABORATORY ATTENDANT, GR.- II

Name – **MR. DILIP KUMAR HAZRA**
Date of Birth – 15/01/1962
Date of Joining – 16/04/1991
Current Designation –
LABORATORY ATTENDNT, GR- II



Name – **MR. RAJ KUMAR NATH**
Date of Birth – 17/02/1980
Date of Joining – 12/12/2005
(At the Registrar Dept., Main Campus)
Date of Joining at this Dept. – 06/01/2006
Current Designation –
LABORATORY ATTENDANT, GR.- III



Name – **MR. SAMIR MITRA MISTRY**
Date of Birth – 06/08/1980
Date of Joining – 12/12/2005
(At the Registrar Dept., Main Campus)
Date of Joining at this Dept. – 06/01/2006
Current Designation –
LABORATORY ATTENDANT, GR.- III

Non Teaching Staff

Library Staff Members

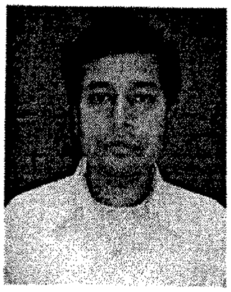
Name– **MRS. JHUMA GUPTA (SENGUPTA)**
Date of Birth – 28/01/1966
Date of Joining – 04/03/1994
Current Designation –
ASSISTANT LIBRARIAN. GR.- I

Name – **MR. SAMIR SARKAR**
Date of Birth – 27/08/1963
Date of Joining – 17/06/1997
Current Designation –
JUNIOR ASSISTANT-CUM-TYPIST

Garden Staff Members

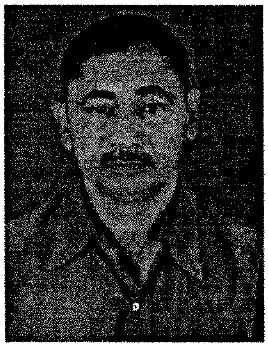
Name – **MR. DURJODHAN PATRA**
Date of Birth – 20/08/1956
Date of Joining –30/01/1974
Current Designation – HEAD MALI

Name – **MR. KANAI MALL**
Date of Birth –12/02/1955
Date of Joining – 20/07/1979
Current Designation – SENIOR MALI



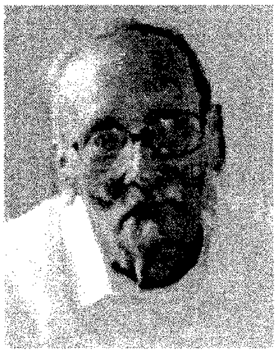
Name – **MR. SUDIP DAS**
Date of Birth – 01/04/1976
Date of Joining – 18/03/2010
Current Designation – JUNIOR MALI

Other Staff Member



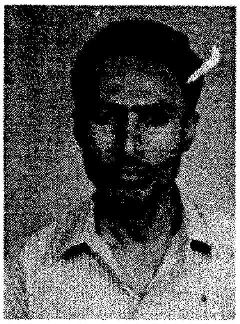
Name – **MR. JAGADISH RAM**
Date of Birth – 07/04/1966
Date of Joining – 23/04/1999
Current Designation – SWEEPER (SENIOR)

Some Ex-Staff Members

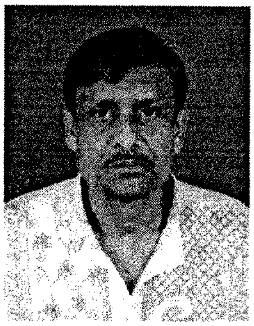


Name – **PRIYA NATH BOSE**
SENIOR LIBRARIAN
Year of Birth – 1924
Year of Joining – 1945
Year of Retirement – 1984

Name – **MR. MAHADEB DAS**
JUNIOR SORTER
Date of Birth – 05/11/1952
Date of Joining – 26/11/1973
(As Library Attendant in Central Library, Main Campus)
Year of Joining in this Department – 1997
(As Junior Sorter)
Date of Retirement – 30/11/2012



Name – **LATE GOPAL NASKAR**
Laboratory Attendant, Gr.- II
Date of Birth – 03/08/1958
Date of Joining – 18/04/1991
(At Polymer Science Dept. Raja Bazar Campus. Then Transferred to this Dept. in the Yr. 2007)
Date of Death – 30/06/2008
(Was in this Dept. till death)

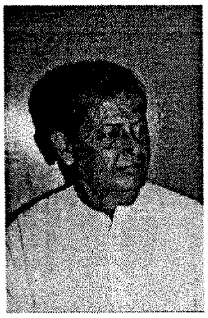


Name – **LATE DIPAK PAUL**
Senior Peon
Date of Birth – 05/10/1962
Date of Joining – 30/10/1990
(At Registrar Department)
Date of Joining in this Dept. – 04/11/1990
Date of Death – 02/12/2008
(Was in this Dept. till death)

Name – **LATE BINAY KUMAR BARDHAN**
Senior Assistant-cum-Typist
Date of Birth – 15/11/1956
Date of Joining – 19/08/1991
(At Establishment Section, Main Campus. Then Transferred to this Department)
Date of Death – 11/12/2008
(Was in this Dept. till death)

Name – **MRS. ANJANA DATTA**
Date of Birth – 21/04/1956
Date of Joining – 19/03/1982
(Main Campus)
May, 1999 (As Assistant Librarian of Botany, Gr.- I)
Current Designation–Superintendent in Central Library

Name – **MR. RAMASISH LAHIRI**
Date of Birth – 08/10/1954
Date of Joining– 12/08/1975
Current Designation–Senior Superintendent (Engineering Section, Darbhanga Building, Main Campus)



Name–**LATE PANCHU GOPAL CHATTERJEE**
SENIOR SCIENTIFIC OFFICER

Name – **KSHITISH KUMAR MITRA**
TECHNICAL ASSISTANT, GR.- I
Date of Birth – 05/06/1951
Date of Joining – 01/10/1975
Date of Retirement – 30/06/2011

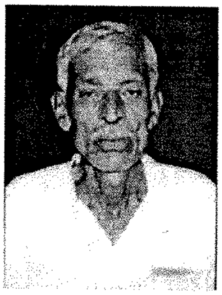
Name – **DR. CHAPALA KANTA SUR**
SENIOR SCIENTIFIC OFFICER
Date of Birth – 07/01/1936
Month of Joining – DECEMBER, 1955
Date of Retirement – 31/01/1996

Name– **DR. BANKIM CHANDRA MANDAL**
SENIOR TECHNICAL ASSISTANT
Date of Birth – 05/01/1943
Date of Joining – 03/03/1968
Date of Retirement – 31/03/2003

Name – **RANAJIT KUMAR BERA**
Date of Birth – 01/05/1945
Year of Joining – 1973
Year of Retirement – 2005

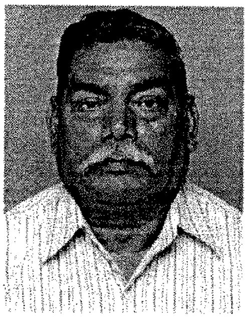
Non Teaching Staff

Name – **PRALOY CHANDRA**
Last Designation – OFFICE ASSISTANT

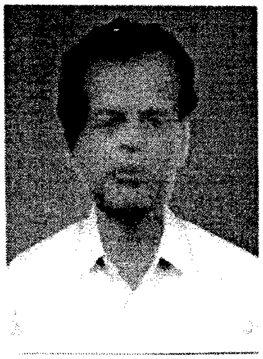


Name – **BHABATARAN MUKHERJEE**
Date of Birth – 02/07/1950
Date of Joining – 01/07/1968
Date of Retirement – 31/07/2010
Last Designation –
SENIOR. LABORATORY ATTENDANT, GR-I

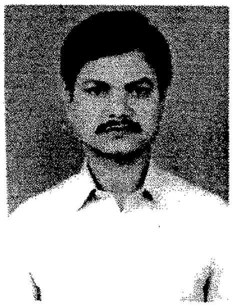
Name – **RANJAN DE**
Date of Birth – 17/06/1946
Year of Joining – 16/02/1974
Date of Retirement – 30/06/2006
Last Designation –
DEPARTMENTAL ARTIST-CUM-PHOTOGRAPHER



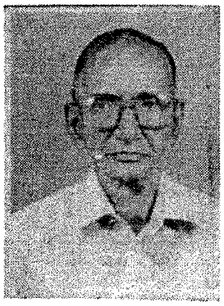
Name – **RAMESWAR SINGH**
Date of Birth – 02/02/1951
Date of Joining – 01/02/1968
Date of Retirement – 28/02/2011
Last Designation – Sr. Peon



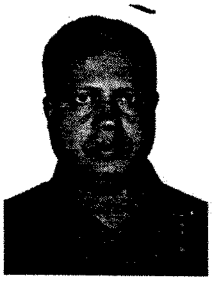
Name – **LATE DHAUDI MALI**
Date of Birth –
Year of Joining – 1942
Date of Retirement –
Last Designation – HEAD MALI



Name – **DILIP KUMAR DUTTA**
Date of Birth – 28/10/1953
Date of Joining – 01/02/1974
Date of Joining in this Department – 27/07/1982 (As Junior Assistant)
Date of Retirement – 31/10/2013
Last Designation – Senior Superintendent



Name – **LATE DHIREN BANERJEE**
Date of Birth – 27/04/1913
Was in Service for 20 Years
Date of Retirement – In the Year 1993
Last Designation –
SENIOR FIELD COLLECTOR



Name – **DR. SK. FAZLUL HAQUE**
Date of Birth – 04/05/1962
Designation – Technical Assistant
Date of Joining – 11/11/1992
Service up to – 29/09/1997
(As Technical Assistant)

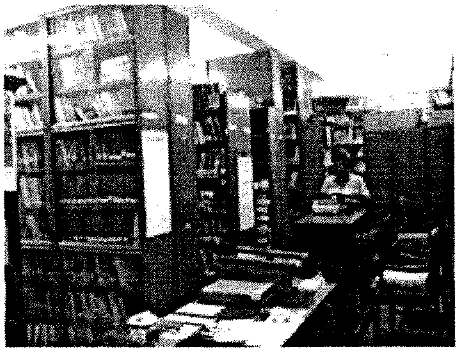
Other Members to be Remembered

PALTU RANJAN DUTTA
SENIOR SUPERINTENDENT;

SUKUMAR MONDAL
SENIOR LABORATORY ATTENDANT, GR. II

Fig.: Some more Ex-Staff Members

The Library



Botany library started functioning in 1943-44 and have a significant collection of rare books, science journals dated 100 years back which is much sought after by students, scholars and faculty members for their day to day classroom and research work.

Botany library at present has a collection of (10646) ten thousand six hundred forty six books. Besides books, Botany library possess seven thousand two hundred and thirty two (7232) volumes of bound journals.

The Botany library boasts a large number of collections of rare books published from the 16th century onwards. Out of the thousand of such books, copies of the title pages of a selected few are shown below:

Name of Five Rare Books & Journals :

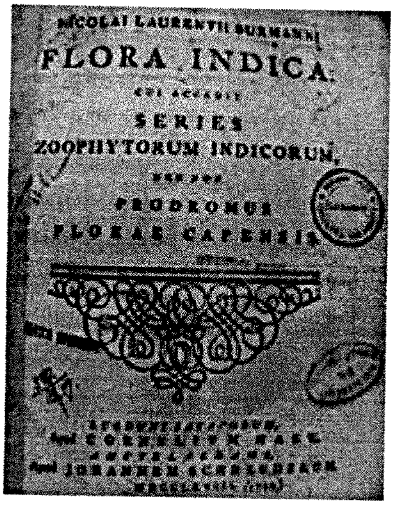
1. The miscellaneous botanical works/Robert Brown.-1865.-**Acc.No.**G71191v.1./GB381-**Call No.**580.8 B811
2. Outlines and classification & special morphology of plants/K.Goebel.-1887. **Acc.No.** G71117/GB765.-**Call No.**581.4G554
3. Genre meliola/A.Gaillard.-1892.-**Acc.No.**G71114/GB234.-**Call No.**581.4G111
4. Manual of Indian timbers/ J.S.Gamble.-1881.- **Acc.No.**G70289/675.- **Call No.**634.9 G145
5. Illustrations of Indian Botany or figures illustrative of each of the natural orders of Indian plants/Robert Wight.-1840.- **Acc.No.**G71244/287.- **Call No.**.581.954 W631

Journal

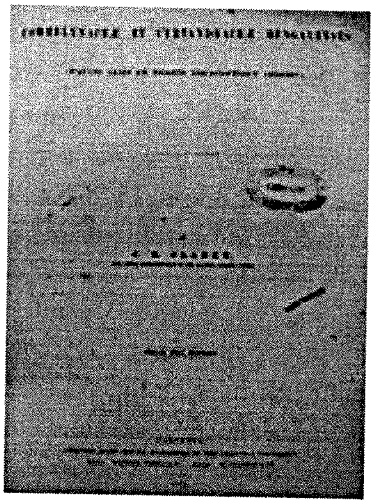
1. The Agricultural Journal of India-1913
2. Bibliotheca Botanica-1889
3. Biological Abstract-1927
4. Nature-1923
5. Journal of Genetics-1920

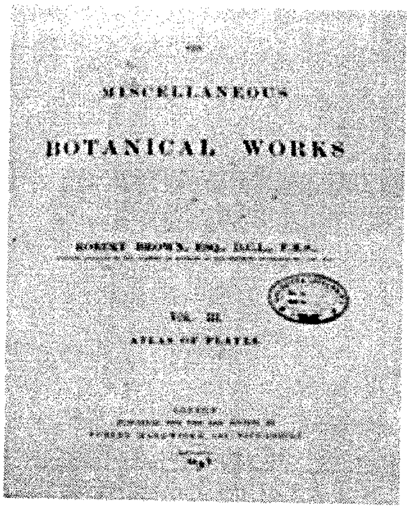
Computerization & networking at the Botany Library has been undertaken under the INFLIBNET Programme of the UGC. The Botany library has started automation of the library activities using SOUL, a versatile and user friendly software from INFLIBNET centre (Taraknath Palit Digital Library located at the 7th floor in the campus). Online Public Access Catalogue (OPAC) of the library has databases of books. In addition to the above the library provides access to nearly One thirty six (136) Electronic Journals to the users of Botany library under the UGC-INFONET Program. In this context it might be mention that our library can be known through the Internet.

Some valuable Books—

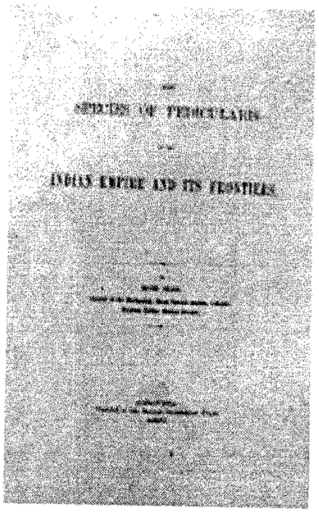


NICOLAI LAURENTII BURMANNI
FLORA INDICA:
SERIES
ZOOPHYTORUM INDICORUM,
PRODROMUS
FLORAE CAPENSIS.





MISCELLANEOUS
BOTANICAL WORKS
ROBERT BROWN, ESQ., D.C.L., F.R.S.
VOL. III.
ATLAS OF PLATES.



INDIAN EMPIRE AND ITS FRONTIERS

Organization / Society / Foundation

1. The Alumni Association of the Postgraduate Department of Botany University of Calcutta

The Postgraduate Department of Botany at the University of Calcutta has completed one hundred years in September 2013. However, the Alumni Association of this department is a late starter. After fifty years of starting Postgraduate Department of Botany, few alumni met in November 1969 and decided to form the Alumni Association. Therein, Founder Members were Late Amiya Kumar Ghosh (President) Late Archana Sharma (General Secretary), Late Gopal Chandra Mitra, Late Ashish Kumar Chandra, Professor Arun Kumar Sharma, Salil Kumar Chaudhuri, Rajat Kanti Chaudhuri, and Nirmalendu Samajpati.

After sixteen years of that initiation, on 30th November 1985 the Alumni Association was registered (No. S/50599 of 1985-86), under Society and Company Act of the Government of West Bengal. Its Memorandum of Understanding clauses was approved in a general body meeting by more than fifty alumni, The clauses include- to perform social and academic activities including holding of Annual Reunion, to establish contact and communication amongst alumni, to help students and research scholars with stipend, to organize lectures at school and colleges, to publish annual souvenir, journals and newsletter, to promote aforestation activity, to popularize botany amongst school and college students, to appoint staff, etc. The Association is fulfilling the objective of that Memorandum.

After sad demise of Amiya Kumar Ghosh, Gopal Chandra Mitra became the President of the Association. In 1992 after his sad demise, Arun Kumar Sharma became the President of the Association. At present total members of the Association are over 350. In 2006, the Pallav, official mouthpiece of the Alumni Association, started coming out, once in a year, with list of members and activities of Association. Since 2007, to celebrate World Environment Day annual tree plantation program is being organized by the Association. Biodiversity Board of the Government of West Bengal sanctioned a project to the Association, in 2009.

It is pertinent to mention here that a website entitled www.alumnipgbotcu.org was hosted by the Alumni Association in 2007 and is being maintained. An updated list of nearly 3000 alumni has been prepared by the present Executive Committee (E.C.) after necessary corrections including present addresses, contact numbers, etc. That list may be forwarded to the Calcutta University for replacing the existing Botany Alumni list.

In 2007, the present E.C. took the charge. Its members are, Arun Kumar Sharma (President), Asok Kumar Biswas (General Secretary), Salil Kumar Chaudhuri, Subhendu Mukherji, Rajat Kanti Chaudhuri, Nirmalendu Samajpati, Ila Chaudhuri, Prabir Kumar Ganguly, Asim Kumar Bhadra, Animesh Ghorai, Santinath Sarkar, Bidyut Kumar Biswas, Arun Kumar Dutta, Madan

Mohon Bhattacharyya, Swapan Kumar Bhattacharyya, Timir Baran Jha, Nanda Dulal Paria ,Ruma Pal, Anil Manna, Rita Kundu, Karabi Datta and Samita Banerjee.

The Alumni, through their Association coordinated actively with the Calcutta University Postgraduate Department of Botany to celebrate its Centenary Celebration, on September 14, 2013 under the Chairmanship of Professor Arun Kumar Sharma, one of the senior-most alumni of this department. Some of the Association's activities during the Centenary Celebration of the Department of Botany at the University of Calcutta are, organizing Centenary Program on Tree Plantation on September 21, 2013, a trip to Sunderbans on February 8th and 9th 2014, and celebrating National Science Day on February 28, 2014.

2. Botanical Society of Bengal

In 1935, the concept of the Botanical Society of Bengal was conceived to promote research in botany, as well as to promote a feeling of fellowship among the Botanists in Bengal. A committee was appointed to ascertain opinions about this from persons of Bengal and elsewhere interested in Botany and its extension to agriculture, horticulture, forestry etc.

Later, a meeting was organized in the Botany Laboratory, Presidency College, Calcutta and Prof. S.P. Agharkar, Head of the Department of Botany, Calcutta University, presided over the function when it was unanimously resolved that "The Botanical Society of Bengal" to be formed, which shall be primarily concerned with all matters affecting the Study of Botany so far as Bengal is concerned.

The inaugural meeting of the Society was held at the Botanical Laboratory of Calcutta University on the 13th of December 1935, Mr. Shyama Prasad Mukherjee, the then Vice Chancellor presided over the function. Other dignitaries present were Sir. P.C. Roy, Dr. S.C. Law, C.C. Calder.

The First organizing Committee forwarded was-

1. Prof. G.P. Mjumder (Presidency College, Calcutta)
2. Prof. I. Banerji, M.Sc. (University College of Science)
3. Dr. Syed Hedavetullah Ph.D (University College of Science)
4. Prof. A.K. Ghosh, M.Sc. (Diosecan College, Calcutta)
5. Prof. S.N. Banerji, M.Sc. (Ripon College)
6. Mr. P.K. Bose (Science College)

Nearly 45 of them expressed their willingness to become members of the society by paying a subscription of Rs 10/- per month

In the meeting, the following resolutions were finally adopted.

1. That the name of the society should be "Botanical Society of Bengal".
2. That it shall never be started as a branch of any parent body.

The first president of the society was Prof. S. P. Agharkar and joint secretaries were Prof.

I.B. Banerjee and Prof. A.K. Ghosh (Calcutta University). Acharya J.C. Bose was the President of the Society for the year 1936. Diamond Jubilee Celebration (1935-1995) was held in 1995, organized by the Society under the Presidentship of Late Dr. Purakayastha. The society organized to celebrate Platinum Jubilee in 2011 in a befitting manner under the Presidentship of Prof. Salil Kumar Chaudhuri.

The objectives of the Society are to organize seminars, symposia, excursions and other academic activities. The society is also publishing a journal of International repute.

The Society is organized a National Symposium on "Plant Diversity: Structure, Function, Utilization and Conservation" in connection with Centenary Celebration of the Dept. of Botany, University of Calcutta on and from December 04 to 06, under the Presidentship of Prof. Nirmalendu Samajpati.

Executive Council : 2013-2014—Nirmalendu Samajpati (President), Rothin Kumar Chakraverty & Nanda Dulal Paria (Vice-Presidents), Subhendu Mukherji (Editor), Parimal Nag (Secretary), Subir Bera (Treasurer), Prabir Kumar Saha (Business Manager), Balaram Majumder, Anita Mukherjee, Ranajit Mallick, Ashlata D' Rozario, Anil Kumar Manna, Ruma Pal, Bharati Nandi, Sushovon Bera, Radhanath Mukhopadhyay, Krishnendu Sarkar (Members).

3. Indian Mycological Society

The Indian Mycological Society started its journey as Mycological Society on 21st August, 1954, under the leadership of Dr. Sachindra Nath Banerjee, well supported by a number of the then eminent Mycologist and Plant Pathologists like Dr. Sahay Ram Bose, Dr. S.N. Dasgupta, Dr. S.B. Chattopadhyay, Dr. Bimal Kumar Bakshi, Dr. Tarasankar Ghosh, Dr. Kanak Ranjan Samaddar, Dr. Madhusudan Chakraborty, Dr. Tarachand Nandi and others.Initially the Society was started in the Mycology and Plant Pathology section of the Department at the ground floor of the old building of Taraknath Palit at the Ballygunge Circular Road, Campus.

The aims and objectives of the Society are :

a) To promote the cause of Mycology and allied subjects like Microbiology, Soil Bacteriology, Plant Pathology, and Fungal Physiology etc.

b) To hold periodical meetings in Calcutta as well as others parts of India with a view to diffuse knowledge in the subjects referred to above among the scientist as well as the public and facilitate mutual interactions among members;

c) To arrange periodical excursion to different parts of India for the study of fungal and allied flora;

d) To cooperate with other scientific bodies for purpose of common interest.

e) To publish transactions, journal, memoirs and other matter of the Society, as may be desirable and

f) To perform all acts that may assist in conduce to or be necessary for the fulfilment of the aims and objects of the Society.

The Society used to organise seminar/symposium regularly .The Silver Jubilee Celebration of the Mycological Society was observed in the year 1979.Further the Society had crossed the mile stone of 50 years and yea long celebration was started on 17th September, 2004 through organizing one day seminar. Thus the long coveted Golden Jubilee Celebration was arranged by organizing the International Symposium on "Agriculturally Important Microorganisms: Conservation, utilization, Bioremediation and Ecological Significance" during 23-25 February, 2006 at the Golden Park Hotel, Ho Chi-Minh Sarani, Kolkata.

The society introduced the prestigious Honorary Fellowship (FIMS), of the Society for their outstanding contribution in the field of their discipline and also used to publish the journals.

The present Executive Body of the IMS as stands for the session 2014-15 :

Elected Office Bearers of the Executive Council for the Session: 2014-2015

President : Dr. R.K. Mittal (Pusa, Samastipur)

Vice-Presidents : Dr. Asit Pal (Kolkata), Prof. Anil K. Chowdhury (Kalyani), Prof. Amal Kanti Paul (Kolkata), Prof. P.K. Bhattacharyya (Kalyani), Prof. N. Samajpati (Ex-Officio, Kolkata)

Secretary : Dr. A.K. Manna (Kolkata)

Jt. Secretary : Dr. Arunava Biswas (Kolkata)

Treasurer : Dr. Bulurani Basu (Kolkata)

Foray Secretary : Dr. Dipak Kr. Nayak (Kolkata)

Business Manager : Dr. Ratna Banerjee (Kolkata)

Librarian : Dr. Maitreyee Banerjee (Kolkata)

Council Members : Prof. Basudev Das Gupta (Mohanpur, Nadia), Dr. Snigdha Maitra (Kolkata), Dr. K.B. Vrinda (Kerala), Dr. T. Prameela Devi (New Delhi), Dr. A. Nagaraja (Bangalore), Dr. Priyabrata Basak (Kolkata), Dr. Krishna Chakraborti (Kolkata), Smit. Indrani Naskar (Kolkata), Prof. Krishnendu Acharya (Kolkata), Dr. R.R. Pandey (Manipur), Dr. Surekha Kundu (Kolkata), Prof. Srikanta Das (Mohanpur, Nadia), Mr. Arun Kr. Dutta (Kolkata), Dr. B.N. Panja (Mohanpur, Nadia), Dr. K.K. Biswas (New Delhi), Dr. Arundhati Pal (Kolkata), Dr. Nicky Singh (Kolkata), Dr. S. Bhagat (New Delhi), Dr. S.K. Beura (Bhubaneswar), Dr. Susanta Kr. Banik (Nagaland).

Editor-in-Chief : Prof. N. Samajpati (University of Calcutta)

Jt. Editors : Prof. B. Mishra (Bhubaneswar), Prof. Biman Kr. Dutta (Silchar), Prof. A.K. Paul (Kolkata), Dr. Milan Bhattacherjee (Australia), Dr. Arunava Biswas (Kolkata), Prof. K.R. Aneja (Kurukshetra).

Board of Editors : Prof. K.R. Samaddar (Kalyani), Prof. Anupam Varma (New Delhi), Prof. Satyabrata Sarkar (Germany), Prof. Arun K. Chatterjee (USA), Smt. Asita Chatterjee (USA), Dr. D.K. Agarwal (New Delhi); Prof. N.I. Singh (Manipur), Prof. Asim Chowdhury (Kolkata), Dr. R.S. Upadhyay (Varanasi), Prof. M.K. Naik (Karnataka), Prof. Arun K. Arya (Baroda), Prof. G.K.N. Chhetry (Manipur).

4. Probir Chatterjee Research Foundation (PCRF)

The foundation stone of Probir Chatterjee Research Foundation was laid in the year 2002 with the leadership of Prof. Ruma Pal, one of the students of Dr. Chatterjee along with 24 other personalities, many of whom were colleagues, friends and students of Dr. Chatterjee. All of them shared a common dream to do something for their beloved "Probir Babu/da" with personal and institutional donations. Their goal was to create awareness among students and develop their interest in cryptogamic research, by bringing students, research scholars and teachers together. Dr. Moloy Chakraborty, the then faculty of Presidency College and colleague of Late Dr. Probir Chatterjee took the charge of the post of "President" while Dr. Alpana Bhattacharya, the then HOD of the Dept. of Botany, Bethune College and sister of Dr.Chatterjee was selected as the Vice President of the Foundation. Prof. Ruma Pal of Calcutta University and Prof. Samit Ray of Visva Bharati started working as Jt. Secretaries and Prof. S. Bera and Dr. M. Changoiwalla as Jt. Treasurers.

Activities: Since its inception a decade ago, PCRF has been striving to stir up interest about cryptogams among students. The various activities undertaken by the foundation include:

Memorial Lecture and Workshop : An annual **'P. Chatterjee Memorial lecture'** is organized where eminent Scientist used to deliver the lecture. The Foundation is also used to organize a workshop for students, research scholars, college and University teachers.

Field Trip: Every year a field trip is used to organize in which many college teachers, research scholars and students used to take part in the events.

Other academic activities like exhibition, Essay and Photography competitions etc. are generally organized by the Foundation for popularization of the subject.

Present EC Members—Prof. S.P. Adhikary (President), Dr. Alplana Bhattacharya, Mr. Probir Gangulee (Vice President), Prof. R. Pal, Prof.Samit Ray (Jt. Secretaries), Prof. Subir Bera, Dr. D. Maity (Jt Treasurer), Dr. Moloy Chakarborty, Dr. Bidyut Biswas, Dr. Ashim Bhadra, Dr. Tapati Das, Dr. Sumona Mukhopadhyay, Dr. Animesh Ghorai, Mr. Bidyut Chatterjee, Dr. Samit Banerjee, Dr. Arpita Mukhopadhyay, Arun Datta, Dr. Subhra Talai, Shanti Nath Sarkar, Dr. Gnanendra Rath (Members)

5. Archana Sharma Foundation of Calcutta

Archana Sharma Foundation of Calcutta (ASFC) is a society registered under the West Bengal Societies Registration Act 1961. The society has been promoted by Professor Arun Kumar

Sharma and his group. It publishes a scientific journal named "NUCLEUS" for the benefit of students, without profit advancement of Science, education and research. The journal is being published by the Indian office of Springer, Germany since 2010. At present, the journal is in its 57th year of publication.

AFSC was registered on 16th September 2009.

The names of the governing body are Prof. Arun Kumar Sharma- President, Prof. Sumita Jha, Vice-President, Dr. Binay Chaubey, Secretary, Prof. Sandip Mukhopadhyay, Asst. Secretary,

Dr. Bani Gajra—Treasurer, Members—Dr. Balaram Chandra Talukdar, Prof. Rabindra Nath Chattrejee, Prof. Anita Mukherjee, Dr. Satyesh Chandra Pakrashi.

Besides these, **A.K. Chandra Memorial Committee** and **Prof. R.P. Purakayastha Memorial Committee** are also working to commemorate the eminent teachers and for the cause of the development of the subject.

PUBLICATION

Algology

Kalipada Biswas

1. K. **Biswas** (1924). The subaerial algae of Barkuda Island, in the Chilka Lake, Ganjam District, Madras Presidency. **J. Proc., Asiat. Soc. Bengal, New Ser.** 20 No. 6.
2. K. **Biswas** (1926). **Flora of the salt-lakes**, Calcutta . Sci. and culture.8.
3. K. **Biswas** (1929). Papers on Malayan aquatic biology. XI. Freshwater algae with addendum. **Journal of the Federated Malay States Museums** 14 pt 3.
5. K. **Biswas** (1930). Contributions to our knowledge of the fresh water algae of Manipur, Assam.**J. Bombay Nat. Hist. Soc.**
7. K. **Biswas** (1932). The role of aerophilous algae in producing colour-effect on the bark of Oreodoxa regia of the Oreodoxa Avenue in the Royal Botanic Garden, Calcutta. India Hedwigia.
8. K. **Biswas** (1932). Census of Indian algae scope of algological studies in India. Part I. **Rev. Algol.** 6(2):197-219.
9. K. **Biswas** (1932). Glimpses of the vegetation of Burma. **Jour.Bomb. Nat. Hist. Soc.** 36 No. 1.
10. K. **Biswas** (1932). Algal flora of the Chilka Lake. **Mem. As. Soc. Bengal,** 11, No. 5.
14. K. **Biswas** (1934). The vegetation of the neighbouring areas of the Raniganj and Jharia coalfields **Trans. Mining & Geol. Inst.** India 29:61-63.
15. K. **Biswas** (1934). Observations on algal collections from Khasia and Jaintia Hills, Assam, India **Hedwigia** 74:1-28.
16. K. **Biswas** (1934). Progress of algological studies in India. **Current Science** 3(6):1-5.
17. K. **Biswas** (1935). Calcutta filter works and Organic growth. **Science and Culture,** 1, No. 3.
18. K. **Biswas** (1936). A new Nannandrous *Oedocladium from* India. **Revue Algologique, Tome** X.
20. K. **Biswas** (1936). Asssociation of some of the common algae with Animals in Indian waters. **Ind. Hedwigia, Band** 76.
21. K. **Biswas** (1937). Two new flowering plants. **Jour. Ind. Bot. Soc.** 16, Nos 1-8.
22. K. **Biswas** (1937). Common diatoms of the Loktak lake. **Jour. As. Soc. Bengal,** New series, 11, no. 9.
23. K. **Biswas** (1942). Algal flora and mosquito larvae. **Science and Culture.** 8, no. 4.

Prabir Chatterjee

24. **P. Chatterjee** (1970). *Lychnothamnus barbatus* (Meyen) Leonh. in West Bengal and its chromosome number. ***Bull. Botan. Soc. Bengal.***, **24**: 131-133.
25. **P. Chatterjee** (1975). Some additions to the Charophytes of West Bengal. **Bull. Botan. Soc. Bengal.**, 29: 105-109.
26. **P. Chatterjee** (1976a). *Chara socotrensis* f. *Nuda*: A new record for West Bengal. **Science and Culture, 42**: 51-52.
27. **P. Chatterjee** (1976b). Cytotaxonomical studies of West Bengal harophyta: Karyotype analysis in *Chara braunii*. **Hydrobiologia, 49**: 171-174.
28. **P. Chatterjee** (1976c). Cytotaxonomic studies on *Chara socotrensis* Nordst. In Kuhn f. *nuda* (Pal) R.D.W. from west Bengal, India. **Cytologia, 41**: 659-663.
29. **P. Chatterjee** (1979a). Karyological investigation of Chara wallichii A. Br. from West Bengal. **Cell and Chromosme Newsletter**, **2**: 21-23.
30. **P. Chatterjee** (1979b). *Chara fibrosa* var. *fibrosa* f. *longicorollata*: A new record for India and its cytology. **Curr. Sci., 48**: 545-547.
31. A. Mukhopadhyay and **P. Chatterjee** (1980). Cytomorphology of *Chara flaccida* A. Br. from West Bengal. **Cell and Chromosome Newsletter**, **3**; 37-39.
32. S. Ray and **P. Chatterjee** (1983). A new technique in Karyological investigation of Characeae. **Cell and Chr. Res**. **6**: 27-29.
33. S. Ray and **P. Chatterjee** (1984). A note on the nucleolar staining in *Chara* sp. **Curr. Sci. 53**: 1301-1302.
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S. R. Bose

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Patents

N. Samajpati

1. Formulated for the first time the microbial consortium for retting of jute fibre which was patented under the Govt. of India Patent regulation.

K. Acharya

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S. Kundu

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6. Patent: Intellectual property of India, Govt. Of India, Intellectual property building, Cp 2 Sector 5, Salt Lake, Kol-91, India. No.: E/2/1610/2012-KOL, Principal Inventor: **S. Kundu** Co-Inventor: Supriyo Chowdhury
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A.K. Chandra

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13. 2) 227878 MBLCU1 BV096959 GI: 38524583 (MADS-box)

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NCBI submission: (Published)

(a) *Oryza sativa* Indica Group *Oxalate Oxidase* 4 (*OXO4*) mRNA Complete cds.
GenBank : KJ781300.1 dated July 22, 2014
PUBMED 23809026

(b) *Oryza sativa* Indica Group Cultivar IRBB21 photosystem II 10 kDa polypeptide (D540) gene, promoter region.
GenBank: KJ857554 dated July 22, 2014
PUBMED 23809026

Calcutta University Herbarium and Experimental Garden

The Calcutta University Herbarium was established in 1920 by Prof. S.P. Agharkar, located in the Department of Botany, University of Calcutta, 35, Ballygunge Circular Road, Kolkata-700 019, West Bengal, India. It is with the acronym 'CUH' and is an important centre for plant taxonomy. The herbarium contains approximately 25,000 specimens of all groups of plants, well maintained under the supervision of the respective faculty members of the Department of Botany, University of Calcutta.

Prof. S.P. Agharkar first incorporated the specimens collected by him during his visit to Europe in 1921 and then in 1935. Apart from this the plants collected from Nepal, and other parts of the Himalayas and Sundarbans were also deposited in this herbarium. A representative collection of mosses was purchased from Vienna and was added to the herbarium by late Professor P. Brühl, the first Head, Department of Botany, University of Calcutta. This is perhaps one of the best collections of mosses in India. The exsiccatae, Mugula's Cryptogams (Algae, Lichens and Mosses), and Hupke Herbarium Cecidologicum were purchased and added to this herbarium.

Subsequently the specimens were collected from different parts of India including the Himalayas and also from Chittagong hill tracts, now in Bangladesh, Malay and Sumatra by the then botanists like I.H. Burkill, G. King and G. King's collaborators, A. Campbell, H. Kunstler, S.P. Agharkar, H.L. Ckakravarty, A.K. Sharma, J.C. Banerjee, S.K. Mukherjee, Rev. Father Scortichini (Perak), H.O. Forbes (Sumatra) and many others. In addition to this, a large number of duplicates representing the flora of Andaman, Sikkim, and Malay, had been received from the then Indian Botanic Garden (now known as A.J.C. Bose Indian Botanic Garden). Besides the collections of Asiatic specimens, there is a large number of collections from Europe and elsewhere incorporated to enrich the herbarium. Interestingly, there are few specimens collected from Australia also.

This herbarium is at present can be considered as an important repository and research centre for Himalayan plants. Huge number of specimens collected from different parts of the Himalaya were deposited by Prof. A.K. Sharma during the programme of study of "Medicinal and Economic Plants of the Himalayas" under the PL480 Project. The post of Herbarium Keeper was held by late Mr. J.C. Banerjee (1928-1955), Dr. N.C. Majumdar (1959-1965), Prof. P.K. Mukherjee (1966-1974) and then Prof. N.D. Paria (1975-1983). Presently the herbarium is maintained by Dr. D. Maity and Prof N.D. Paria.

The angiosperm specimens are the key elements of this depository. More than 15,386 specimens are belonging to angiosperms including the unidentified specimens, collected not only from Indian territory, but also from faraway of European countries. These huge angiosperm collections encompass about 1840 genera spread over 165 families of which 137 families are of dicots and 28 are of monocots. There are as many as 1482 and 358 genera of dicots and monocots respectively. Some well represented families of this herbarium are Acanthaceae, Apocynaceae, Asclepiadaceae, Asteraceae, Boraginaceae, Brassicaceae, Caryophyllaceae, Cyperaceae, Ericaceae, Gentianaceae, Lamiaceae, Onagraceae, Orchidaceae, Papilionaceae, Rosaceae, Saxifragaceae, Scrophulariaceae, Solanaceae, Verbenaceae, etc. Total number of Indian specimens deposited in CUH is about 6854, while the foreign gatherings are nearly 2863. Besides this there are huge unlocalised specimens without referring any localities, mainly collected abroad having the number of about 4053. Apart from these dried specimens on herbarium sheets, there are many preservations in bottles containing delicate interesting plants.

One of the historic collections is the specimens from Chhotanagpur (the then Chutianagpur) of which almost the entire set of the collection of Rev. A. Campbell made during 1880s for the project of '*Flora of Chutianagpur*' was deposited here. More than 963 specimens representing about 531 species are the part of this collection. Majority of these specimens are incorporated in the famous work of Haines ["*Botany of Bihar and Orissa* (1921-1925)/*A Forest Flora of Chota Nagpur including Gangpur and the Santal-Parganahs*-1910"]. Among the Campbell's collections the members of family Papilionaceae represent the highest number having 107 specimens belonging to over 43 species.

The interesting feature of this depository is that almost 50% specimens are belonging to foreign countries. The oldest collection of this herbarium is *Phyllirea angustifolia* L. of the family Oleaceae collected by F. Gyol from Spain (Europe) in 1805, more than 200 years back. Majority of the specimens are of century old. For examples, *Arenaria procumbens*Vahl of the family Caryophyllaceae collected in 1900 from Algeria, Africa. However, in respect to the Indian origin, *Plectronia rheedi* Bedd. of the family Rubiaceaeis the oldest one collected from south India by Biatler and Hallberg in the year 1819, even though of about 190 years old. All these are treated as heritage specimens with national as well as international significance.

The herbarium contains several '*Type Specimens*' of Indian and Malayan taxa, which again considered to reflect its international status and importance as taxonomic research centre. The holotype of *Kedarnatha sanctuarii* Mukh.& Const. (Apiaceae/ Umbelliferae) is one of them. S.K. Mukherji deposited the holotype specimen of *Mangifera philippinensis* Mukherji (Anacardiaceae) during his monographic study on the genus *Mangifera* L. Another holotype specimen i.e. *Dicrea agharkarii* Nandi (Podostemaceae), named after the famous botanist and the founder of this herbarium Prof. S.P. Agharkar, is also present in CUH.. Apart from this few paratype, isotype as well as syntype specimens, mainly of Malaysian origin, are also housed in CUH. The *Type Herbarium* is enriched day by day with the deposition of the type specimens of recently described taxa, mainly by the faculty members. The holotype, isotype (duplicate at CAL) and paratype specimens of very recently described species *Gentiana springateana* D. Maity (2014) is deposited at CUH. The herbarium cum museum is a repository of many interesting dry and wet preserved non-vascular and vascular cryptogams. There are also many important specimens of gymnosperms in this herbarium. Every year new collections are being added through exploration as well as educational tours in the different phytogeographical regions of India. This herbarium is no doubt an important research center for floristics as well as plant taxonomy in general and study of the Himalayan flora in particular.

Some of the well represented taxa in this herbarium are *Anaphalis, Androsace, Anemone, Aster, Berberis, Begonia, Blumea, Clematis, Elatostemma, Gentiana, Hedyotis(Oldenlandia), Hypericum, Jasminum, Leucas, Magnolia,Pinus, Pogostemon, Polygala, Primula, Quercus, Ranunculus, Rhododendron, Saxifraga, Senecio, Smilax, Stellaria, Swertia, Thalictrum, Utricularia, Vernonia, Viburnum, Eragrostis, Panicum, Juniperus, Cupressus,* etc.

In CUH hundreds of botanically curious plants are housed viz. *Arceuthobium minutissimum* (smallest angiosperm), *Drosera burmanni, D. peltata, Nepenthes khasiana, Utricularia* spp. (insectivorous plant), *Balanophora dioica, Monotropa uniflora, Orobanche aegyptica* (root parasite), *Arisaema* spp. (cobra lily), *Helwingia himalaica*(with epiphyllous flowers), *Rhododendron arboreum, R. campanulatum, R. thomsoni* (rhododendron), *Ginkgo biloba, Metasequoia, Welwitschia* (living fossil), *Taxus baccata* (european yew), *Ephedra, Gnetum* and *Welwitschia* (gnetophyte), *Psilotum* and *Tmesipteris* (primitive pteridophytes), *Platycerium* spp. (staghorn fern), *Cyathea* and *Hemitelia* (tree fern), *Astraeus hygrometricus, Calocybe indica, Morchella conica* (edible), *Amanita phalloides, A. verna* (poisonous), *Geastrum arenarius* (earth star fungus), *Ulva lactuca* (sea lettuce), *Enteromorpha intestinalis* (aonori), *Gracilaria verrucosa* (agarophyte), *Iyengari* (rare taxon), etc.

The Herbarium is attached with well-maintained Museum housed with a number of good collections of cryptogams, phanerogams and fossil specimens, maintained by Prof. S. Bera. The Museum for fossil specimens is outstanding and enriched with a good number of plant megafossils and permanent slides including holotypes viz., *Senotheca* Banerjee, *Derissocarpon miocenicum* Mitra & Banerjee, *Sharmastachys pendulata* Banerjee & D' Rozario, *Palmoxylon ghoshii* Bera & Banerjee, etc. It is again housed with a marvelous collections of marine algae mainly of Indian coast and Pacific coast, maintained by Prof. R. Pal and partly by the author. Some of the interesting marine macro-algal taxa, *Acanthophora spiciformis, Chaetomorpha* sp., *Cladophora, Codium elongatum ,Chondrus verucosus, Euchuma* sp., *Fucus* sp., *Gracilaria corticata, Laminaria* sp., *Padina* sp., *Prionitis lyallii, Pterochondria woollii, Saccarina* sp., *Spatoglossum* sp., *Scinaia australis,* are maintained in CUH. A remarkable collection of edible, non-edible and poisonous macro-fungi of West Bengal and different corners of the country is well preserved and maintained by Prof. Krishnendu Acharya. Several macrofungal type specimens such as *Volvariella pusilla* var. *minuta* K. Acharya, A.K. Dutta & P. Pradhan; *Marasmius midnapurensis* A.K. Dutta, P. Pradhan & K. Acharya; *Russula kanadii* A.K. Dutta & K. Acharya and *Marasmius vladimirii* A.K. Dutta & K. Acharya are kept in CUH (Holotypes are deposited at CAL). Among these specimens, some new recorded macro-fungi from India are *Clathrus ruber*; *Clavaria vermicularis* var. *singaporensis*; *Coprinus lagopides*; *Micropsalliota lateritia* var. *vinaceipes*; *Mutinus caninus* var. *albus*; *Phallus Multicolor*; *Scleroderma macrorhizon*, *Tulostoma chudaei*, etc. whereas *Aseroë rubra*; *Calvatia cyathiformis*; *Lysurus periphragmoides*; *Phallus rubicundus*; *Pisolithus arhizus*; *Ramaria fumigata*; *Scleroderma cepa*,

Volvariella pusilla etc. represents the new recorded species from West Bengal. Both Herbarium and Museum provide facilities in teaching and research in the Department of Botany, University of Calcutta. In addition, these facilities are also extended to the students of the under graduate and post graduate levels of other universities and research institutions. However, the exchange, loan and lending, etc. are not provided. The culture collections of algae and fungi as adjunct to the Herbarium and Museum are also extending facilities for the students and researchers.

The department and herbarium are with reference libraries consisting of monographs and floras, Index Kewensis, Index Lodinensis and other taxonomic literatures and bibliographics, including several text books, reference books, journals and periodicals. It has the reading and lending facilities to the scholars, teachers and researchers. It thus can be concluded with:

"Herbarium is Sacred Masonry
Specimens are Incarnations of the God
Type is the Almighty
Taxonomists are the Worshipers".

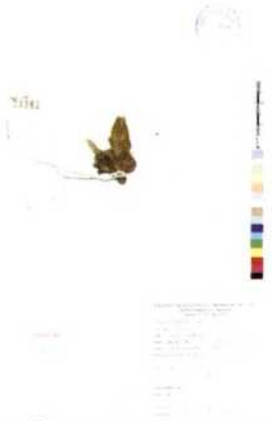
The Experimental Garden of the department was established in 1918 with an area of about 2 ha including a pond of about 0.4 ha. The Garden has mainly the collections of angiosperms besides some species pteridophytes, bryophytes, mushrooms and algae. However, the remarkable collection of gymnosperms with nearly 20 species including *Pinus, Podocarpus, Ephedra*, etc. is perhaps one of the best gymnosperm collections in India by an institute. Some angiosperms of high altitude can also be seen here. Moreover, one green house and one glass house are present inside the garden campus.

In a special publication of the Botanical Society of Bengal in the 1950, K.P. Biswas, the then Superintendent of the Indian Botanic Garden, Calcutta (now A.J.C. Bose Indian Botanic Garden), had presented a 'Systematic Account of the Flora of South Calcutta with special reference to the Ballygunge Science College Campus'. He had listed a mixed group of herbs, shrubs and trees of 270 sp. under 62 different families. Presently the garden has about 211 species of angiosperms, 17 species of gymnosperms, 14 species of pteridophytes, two species of bryophytes and 11 species of algae.

Under angiosperms a significant number of medicinal plants are also growing well inside the garden campus. Students visit regularly during their M.Sc. courses along with the respective teachers to know about different groups of plants from algae to angiosperms. Teaching materials of different groups of plants particularly for practical purpose starting from algae to angiosperms are well maintained.

Museum and Herbarium (CUH)

Type specimens at CUH



Holotype of *Gentiana springateana* D. Maity
[Edinburgh J. Bot. 71(3):289.2014]

Holotype of *Rivina humilis* var. *bracteata* D.Maity&al.
[Rheedea 24(2):103.2014]

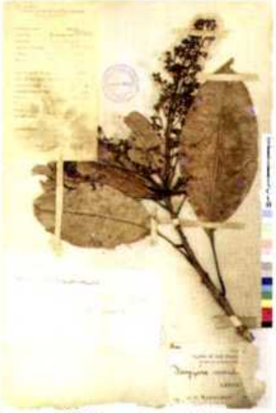
Holotype of *Marasmius midnapurensis* A.K. Dutta *et al.* [Mycotaxon 128:119.2014]

Holotype of *Marasmius vladimirii* A.K.Dutta & K. Acharya [Persoonia 33:267.2014]

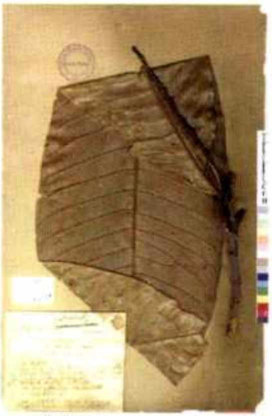
Holotype of *Elaeocarpus prelanceaefolius* Bera *et al.*
[Jour. Geol. Soc. India 64:350.2004]

Holotype of *Sharmastachys pendulata* Banerjee & D'Rozario
[Geoscience J. 20(1):26.1999]

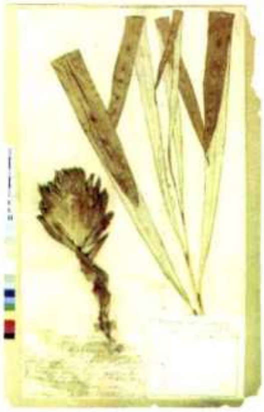
Type specimens at CUH



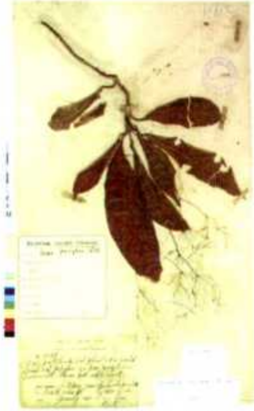
Holotype of *Mangifera philippinensis* Mukherji
(Lloydia 12: 108. 1949)



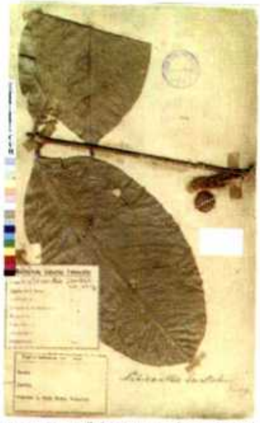
Isosyntype of *Castanopsis catappifolia* King ex Hook.*f.* (Fl. Brit. India 5: 621. 1888)



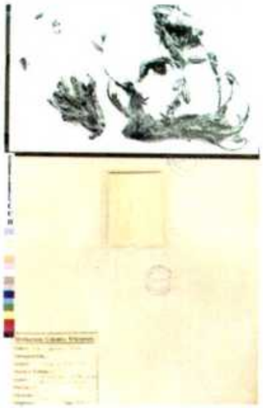
Isosyntype of *Amomum stenoglossum* Baker
(Fl. Brit. India 6: 234. 1892)



Isolectotype of *Boea parviflora* Ridl.
(J. Straits Branch Roy. Asiat. Soc. 44: 76. 1905)



Isosyntype of *Lepisanthes scortechinii* King
(J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 65:429.1896)



Holotype of *Dicraeia agharkari* Nandi
(Dept. Sc., Calcutta Univ. n.s.,1: 41. 1937)

List of Plants in Calcutta University Botanical Garden

Sl. No.	Name of Plants	Family	Habit
			H - HERB
1.	*Acalypha indica*	Euphorbiaceae	H
2.	*Ageratum conyzoides*	Asteraceae	H
3.	*Allium chinensis*	Alliaceae	H
4.	*Allium tuberosum*	Alliaceae	H
5.	*Aloe vera*	Asphodelaceae	H
6.	*Alpinia galanga*	Zingiberaceae	H
7.	*Alpinia zerumbet*	Zingiberaceae	H
8.	*Alternanthera sessilis*	Amaranthaceae	H
9.	*Alternanthera tenella*	Amaranthaceae	H
10.	*Amaranthus spinosus*	Amaranthaceae	H
11.	*Amaranthus viridis*	Amaranthaceae	H
12.	*Amarylis* sp.	Amaryllidaceae	H
13.	*Andrographis paniculata*	Acanthaceae	H
14.	*Anthurium* sp.	Araceae	H
15.	*Asparagus racemosus*	Liliaceae	H
16.	*Bacopa monnieri*	Scrophulariaceae	H
17.	*Bryophyllum calycinum*	Crassulaceae	H
18.	*Canavalia ensiformis*	Papilionaceae	H
19.	*Cardamine hirsuta*	Brassicaceae	H
20.	*Centella asiatica*	Apiaceae	H
21.	*Cleome rutidosperma*	Capparidaceae	H
22.	*Clitoria ternatea*	Papilionaceae	H
23.	*Coccinia cordifolia*	Cucurbitaceae	H
24.	*Costus speciosus*	Costaceae	H
25.	*Crinum asiaticum*	Amaryllidaceae	H
26.	*Cryptocoryne cilliata*	Araceae	H
27.	*Curcuma amada*	Zingiberaceae	H
28.	*Curcuma aurantiacum*	Zingiberaceae	H
29.	*Curcuma caesia*	Zingiberaceae	H
30.	*Curcuma inodora*	Zingiberaceae	H

31.	*Curcuma longa*	Zingiberaceae	H
32.	*Curcuma rubescens*	Zingiberaceae	H
33.	*Cymbidium aloifolium*	Orchidaceae	H
34.	*Cymbopogon citratus*	Poaceae	H
35.	*Cyperus flabeliformis*	Cyperaceae	H
36.	*Dendrobium amoenum*	Orchidaceae	H
37.	*Dendrobium aphyllum*	Orchidaceae	H
38.	*Dentella repens*	Rubiaceae	H
39.	*Dioscorea prazeri*	Dioscoreaceae	H
40.	*Enydra fluctuans*	Asteraceae	H
41.	*Eragrostis tenella*	Poaceae	H
42.	*Euphorbia microphylla*	Euphorbiaceae	H
43.	*Euphorbia thymifolia*	Euphorbiaceae	H
44.	*Fleurya interrupta*	Urticaceae	H
45.	*Globba bulbifera*	Zingiberaceae	H
46.	*Globba ophioglossa*	Zingiberaceae	H
47.	*Globba schomburgkii*	Zingiberaceae	H
48.	*Gymnema sylvestre*	Asclepiadaceae	H
49.	*Haemanthus* sp.	Amaryllidaceae	H
50.	*Hedychium coronarium*	Zingiberaceae	H
51.	*Hedychium spicatum*	Zingiberaceae	H
52.	*Heliconia metallica*	Mussaceae	H
53.	*Hemidesmus indicus*	Asclepiadaceae	H
54.	*Hydrilla verticillata*	Hydrocharitaceae	H
55.	*Kaempferia elegans*	Zingiberaceae	H
56.	*Kaempferia rotunda*	Zingiberaceae	H
57.	*Kallstroemia purviflora*	Zygophyllaceae	H
58.	*Kyllinga monocephala*	Cyperaceae	H
59.	*Lemna minor*	Lemnaceae	H
60.	*Mazus rugosus*	Scrophulariaceae	H
61.	*Mikania scandens*	Asteraceae	H
62.	*Mimosa pudica*	Mimosaceae	H
63.	*Mollugo spergula*	Molluginaceae	H

64.	*Monochoria hastifolia*	Alismataceae	H
65.	*Nicotiana plumbaginifolia*	Solanaceae	H
66.	*Ocimum cannum*	Lamiaceae	H
67.	*Ocimum sanctum*	Lamiaceae	H
68.	*Oldenlandia corymbosa*	Rubiaceae	H
69.	*Oldenlandia paniculata*	Rubiaceae	H
70.	*Oxalis corniculata*	Oxalidaceae	H
71.	*Peperomea pellucida*	Piperaceae	H
72.	*Petunia hybrida*	Solanaceae	H
73.	*Phyllanthus amarus*	Euphorbiaceae	H
74.	*Pilea microphylla*	Urticaceae	H
75.	*Piper longum*	Piperaceae	H
76.	*Plumbago zeyalnica*	Plumbaginaceae	H
77.	*Pothos scandens*	Araceae	H
78.	*Rhoeo discolor*	Lilliacae	H
79.	*Richardia scabra*	Rubiaceae	H
80.	*Rivina humilis*	Phytolaccaceae	H
81.	*Ruellia prostrata*	Acanthaceae	H
82.	*Ruellia tuberosa*	Acanthaceae	H
83.	*Russelia equesitiformis*	Scrophulariaceae	H
84.	*Sagittaria montevidensis*	Alismataceae	H
85.	*Sansevieria trifasciata*	Haemodoraceae	H
86.	*Scoparia dulcis*	Scrophulariaceae	H
87.	*Setcreasea* sp.	Commelinaceae	H
88.	*Smilax ovalifolium*	Smilacaceae	H
89.	*Smilax zeylanica*	Smilacaceae	H
90.	*Solanum nigrum*	Solanaceae	H
91.	*Tinospora cordifolia*	Menispermaceae	H
92.	*Tradescantia* sp.	Commelinaceae	H
93.	*Tylophora indica*	Asclepiadaceae	H
94.	*Typhonium trilobatum*	Araceae	H
95.	*Vandellia crustacea*	Scrophulariaceae	H
96.	*Vandellia hirsuta*	Scrophulariaceae	H

97.	*Vandellia multifida*	Scrophulariaceae	H
98.	*Vernonia cinerea*	Asteraceae	H
99.	*Vinca rosea*	Apocynaceae	H
100.	*Zebrina pendula*	Commelinaceae	H
101.	*Zingiber officinale*	Zingiberaceae	H
102.	*Zingiber zerumbet*	Zingiberaceae	H
			S - SHRUB
103.	*Acalypha hispida*	Euphorbiaceae	S
104.	*Adenium* sp.	Apocynaceae	S
105.	*Agave* sp.	Agavaceae	S
106.	*Allamanda cathartica*	Apocynaceae	S
107.	*Ambroma augusta*	Sterculiaceae	S
108.	*Annanas comosus*	Bromelliaceae	S
109.	*Ardisia solanacea*	Myrsinaceae	S
110.	*Artabotrys odoratisimus*	Annonaceae	S
111.	*Bambusa* sp.	Poaceae	S
112.	*Bougainvillea spectabilis*	Nyctaginaceae	S
113.	*Caesalpinia pulcherrima*	Caesalpiniaceae	S
114.	*Caloptropis gigantea*	Asclepiadaceae	S
115.	*Camelia japonica*	Theaceae	S
116.	*Cassia occidentalis*	Caesalpinaceae	S
117.	*Chrysalidocarpus* sp.	Arecaceae	S
118.	*Chrysanthemum* sp.	Asteraceae	S
119.	*Citrus aurantifolia*	Rutaceae	S
120.	*Clerodendrum siphonanthus*	Verbenaceae	S
121.	*Codiaeum varigatum*	Euphorbiaceae	S
122.	*Corchorus* sp.	Tiliaceae	S
123.	*Dianella enceformis*	Liliaceae	S
124.	*Dracaena spicata*	Liliaceae	S
125.	*Duranta repens*	Verbenaceae	S
126.	*Euphorbia cotinifolia*	Euphorbiaceae	S
127.	*Euphorbia pulcherrima*	Euphorbiaceae	S
128.	*Ficus pumila*	Moraceae	S

129.	*Galphimia gracilis*	Malpighiaceae	S
130.	*Gustavia insignis*	Lecythidaceae	S
131.	*Hibiscus rosa-sinensis*	Malvaceae	S
132.	*Ixora coccinia*	Rubiaceae	S
133.	*Ixora parviflora*	Rubiaceae	S
134.	*Jasminum sambac*	Apocynaceae	S
135.	*Jatropha gossypifolia*	Euphorbiaceae	S
136.	*Jatropha pandurifolia*	Euphorbiaceae	S
137.	*Jatropha podagrica*	Euphorbiaceae	S
138.	*Justicia gendarussa*	Acanthaceae	S
139.	*Lantana camara*	Verbenaceae	S
140.	*Lawsonia alba*	Lythraceae	S
141.	*Lawsonia inermis*	Lythraceae	S
142.	*Malpighia coccigera*	Malpighiaceae	S
143.	*Malvaviscus arboreus*	Malvaceae	S
144.	*Memecylon edule*	Melastomaceae	S
145.	*Muehlenbekia platyclados*	Polygonaceae	S
146.	*Murraya koenigii*	Rutaceae	S
147.	*Nerium indicum*	Apocynaceae	S
148.	*Paederia foetida*	Rubiaceae	S
149.	*Pandanus foetidus*	Amaryllidaceae	S
150.	*Phyllanyhus reticulatus*	Euphorbiaceae	S
151.	*Polyalthia suberosa*	Annonaceae	S
152.	*Punica granatum*	Punicaceae	S
153.	*Raphidophora glauca*	Araceae	S
154.	*Rauvolfia serpentina*	Apocynaceae	S
155.	*Rauvolfia tetraphylla*	Apocynaceae	S
156.	*Ricinus communis*	Euphorbiaceae	S
157.	*Solanum torvum*	Solanaceae	S
158.	*Stropanthus wallichii*	Apocynaceae	S
159.	*Tabernaemontana coronaria*	Apocyanaca	S
160.	*Tiliacora racemosa*	Menispermaceae	S
161.	*Withania somnifera*	Solanaceae	S

			T - TREE
162.	*Achras sapota*	Sapotacea	T
163.	*Adenanthera pavonina*	Papilioinaceae	T
164.	*Aegle mermelos*	Rutaceae	T
165.	*Azadirachta indica*	Meliaceae	T
166.	*Barringtonia acutangula*	Lecythidaceae	T
167.	*Bassia latifolia*	Sapotaceae	T
168.	*Bombax malabaricum*	Bombacacaeae	T
169.	*Breynea rhamnoides*	Euphorbiaceae	T
170.	*Bursera serrata*	Burseraceae	T
171.	*Calophyllum inophyllum*	Clusiaceae	T
172.	*Careya arborea*	Myrtaceae	T
173.	*Caryota urens*	Arecaceae	T
174.	*Cassia fistula*	Caesalpiniaceae	T
175.	*Cassia laevigata*	Caesalpiniaceae	T
176.	*Cassia multijuga*	Caesalpiniaceae	T
177.	*Cinnamomum tamala*	Lauraceae	T
178.	*Citrus medica*	Rutaceae	T
179.	*Cordia myxa*	Boraginaceae	T
180.	*Croton roxburghii*	Euphorbiaceae	T
181.	*Diospyros discolor*	Ebenaceae	T
182.	*Emblica officinalis*	Euphorbiaceae	T
183.	*Euphoria longan*	Sapindaceae	T
184.	*Excoecaria agallocha*	Euphorbiaceae	T
185.	*Ficus benghalensis*	Moraceae	T
186.	*Ficus benjamina*	Moraceae	T
187.	*Ficus elastica*	Moraceae	T
188.	*Ficus hispida*	Moraceae	T
189.	*Grevillea robusta*	Proteaceae	T
190.	*Hamelia patens*	Rubiaceae	T
191.	*Heritiera fomes*	Sterculiaceae	T
192.	*Hopea odorata*	Dipterocarpaceae	T
193.	*Jacquinia ruscifolia*	Theophrastaceae	T

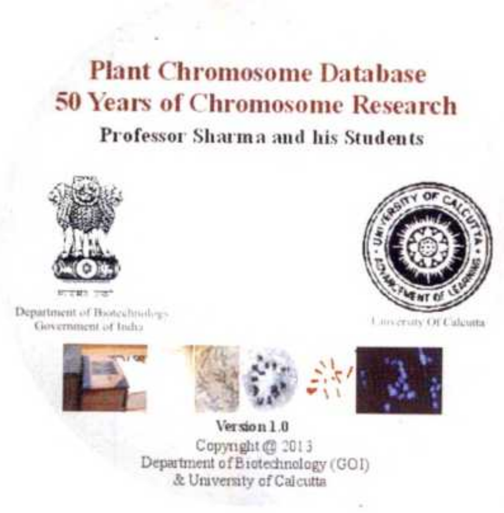
194.	*Kleinhovia hospita*	Sterculiaceae	T
195.	*Magnolia grandiflora*	Magnoliaceae	T
196.	*Malpighia glabra*	Malpighiaceae	T
197.	*Mangifera indica*	Anacardiaceae	T
198.	*Michelia champaca*	Magnoliaceae	T
199.	*Morus australis*	Moraceae	T
200.	*Murraya exotica*	Rutaceae	T
201.	*Beaucarnea recurvata*	Agavaceae	T
202.	*Nyctanthes arbortristis*	Oleaceae	T
203.	*Ochna artopupurea*	Ochnaceae	T
204.	*Parkia roxburghii*	Mimosaceae	T
205.	*Plumeria acutifolia*	Apocynaceae	T
206.	*Psidium guajava*	Myrtaceae	T
207.	*Pterocarpus marsupium*	Fabaceae	T
208.	*Pterospermum acerifolium*	Sterculiaceae	T
209.	*Putranjiva roxburghii*	Euphorbiaceae	T
210.	*Roylstonia regia*	Arecaceae	T
211.	*Samanea saman*	Mimosaceae	T
212.	*Sapindus mukorossi*	Sapindaceae	T
213.	*Saraca asoca*	Caesalpinaceae	T
214.	*Sterculia alata*	Sterculiaceae	T
215.	*Sterculia foetida*	Sterculiaceae	T
216.	*Streblus asper*	Moraceae	T
217.	*Strychnosnux-vomica*	Loganiaceae	T
218.	*Swietenia mehgonii*	Meliaceae	T
219.	*Syzygium jambos*	Myrtaceae	T
220.	*Tamarindus indica*	Caesalpinaceae	T
221.	*Terminalia arjuna*	Combretaceae	T
222.	*Trema orientalis*	Urticaceae	T
223.	*Vanilla planifolia*	Orchidaceae	Climber
224.	*Vitex negundo*	Verbenaceae	T
225.	*Wrightia tinctoria*	Apocynaceae	T
226.	*Wrightia tomentosa*	Apocynaceae	T

227.	*Agathis robusta*	Araucariaceae	Gymnosperm
228.	*Araucaria cunninghamia*	Araucariaceae	Gymnos.
229.	*Cupressus* sp.	Cupressaceae	Gymnos.
230.	*Cycas circinalis*	Cycadaceae	Gymnos.
231.	*Cycas revoluta*	Cycadaceae	Gymnos.
232.	*Dioon edule*	Cycadaceae	Gymnos.
233.	*Dioon spinulosum*	Cycadaceae	Gymnos.
234.	*Ephedra foliata*	Ephedraceae	Gymnos.
235.	*Juniperus recurva*	Cupressaceae	Gymnos.
236.	*Pinus longifolia*	Pinaceae	Gymnos.
237.	*Podocarpus* sp.	Podocarpaceae	Gymnos.
238.	*Taxus wallichiana*	Taxaceae	Gymnos.
239.	*Taxodium distichum*	Taxodiaceae	Gymnos.
240.	*Thuja spicata*	Cupressaceae	Gymnos.
241.	*Zamia floridana*	Cycadaceae	Gymnos.
242.	*Zamia furfuracea*	Cycadaceae	Gymnos.
243.	*Zamia angustifolia*	Cycadaceae	Gymnos.
244.	*Acrostichum aureum*	Pteridaceae	Pteridophyte
245.	*Adiantum lunulatum*	Adiantaceae	Pterido.
246.	*Ampelopteris prolifera*	Thelipteridoceae	Pterido.
247.	*Azolla pinnata*	Azollaceae	Pterido.
248.	*Christella dentate*	Thelipteridaceae	Pterido.
249.	*Drynaria propinqua*	Polypodiaceae	Pterido.
250.	*Marsilea minuta*	Marsileaceae	Pterido.
251.	*Nephrolepis falcata*	Davalliaceae	Pterido.
252.	*Ophioglossum reticulatum*	Ophioglossaceae	Pterido.
253.	*Phymatosorus colopendria*	Polypodiaceae	Pterido.
254.	*Pteris longifolia*	Pteridaceae	Pterido.
255.	*Salvinia natans*	Salviniaceae	Pterido.
256.	*Selaginella bryopteris*	Selaginellaceae	Pterido.
257.	*Riccia discolor*	Ricciaceae	Bryophyte
258.	*Cyathodium* sp.	Targioniaceae	Bryop.
259.	*Taxithelium nepalense*	Sematophyllaceae	Bryop.

Centres and Annex Buildings

1. Plant Chromosome Information Centre,
Bio-Resource Information Center (BRIC-III)
Indian Bioresource Information Network (IBIN)-DBT, GOI
Department of Botany, University of Calcutta
Estd. 2011

India has a long tradition of plant cytogenetics and enormous amount of data has been accumulated during the past 7-8 decades. Compiling this information from across the country, in an easily searchable format would be useful for those working in the areas of cyto-genetics, cyto-taxonomy and molecular phylogeny. Such chromosome databases provide a platform for accumulating not only basic cytological data but also integrating data on genetic and physical mapping, sequences, etc. Though quite a few databases providing information on animal and human chromosomes exist for public use, a comprehensive cytological data for plants is still lacking. As a first step towards this, we attempted to compile data on plant chromosomes from the extensive cytogenetical studies done since 1950 by Professor AK Sharma and his associates in the Centre of Advanced Study, Department of Botany, Calcutta University on Indian species covering monocotyledons, dicotyledons, pteridophytes, gymnosperms and algae. As a result so far, we have digitized cytological data of over 575 Genera, 1570 species 3700 entries encompassing over 100 families; some of the most widely covered families include Liliaceae (296 records), Poaceae (227 records), Leguminosae (153 records), Orchidaceae (142 records), Araceae (117 records), Apiaceae (95 records), Polypodiaceae (94 records), Amaryllidaceae (76 records), Zingiberaceae (69 records), Ranunculaceae (60 records), Characeae (23 records), and Cycadaceae (5 records). The database provides detailed taxonomic description compiled by the University of Agricultural Sciences Bangalore, along with the chromosome number, meiotic data, DNA content, reference etc. In addition, Somatic, Karyotype, Chromosome Mapping and Meiotic images are also available. The data can be recovered in a multiple search criteria depending upon the needs of the end user, such as. This database being developed as a part of Bioresource Information Centre (BRIC) for Indian Bioresource Information Network (IBIN) funded by the Department of Biotechnology, Government of India is available both in the form of CDs for desktop use and also in the web format at www.ibin.gov.in. where several other data sets are also made available. In the next phase, we plan to expand the database to a wider range of taxonomic groups and to a wide range of themes such as molecular data and finger printing, through a network of research groups across the country.



Plant Chromosome Database
50 Years of Chromosome Research
Professor Sharma and his Students

Department of Biotechnology
Government of India

University Of Calcutta

Version 1.0
Copyright @ 2013
Department of Biotechnology (GOI)
& University of Calcutta

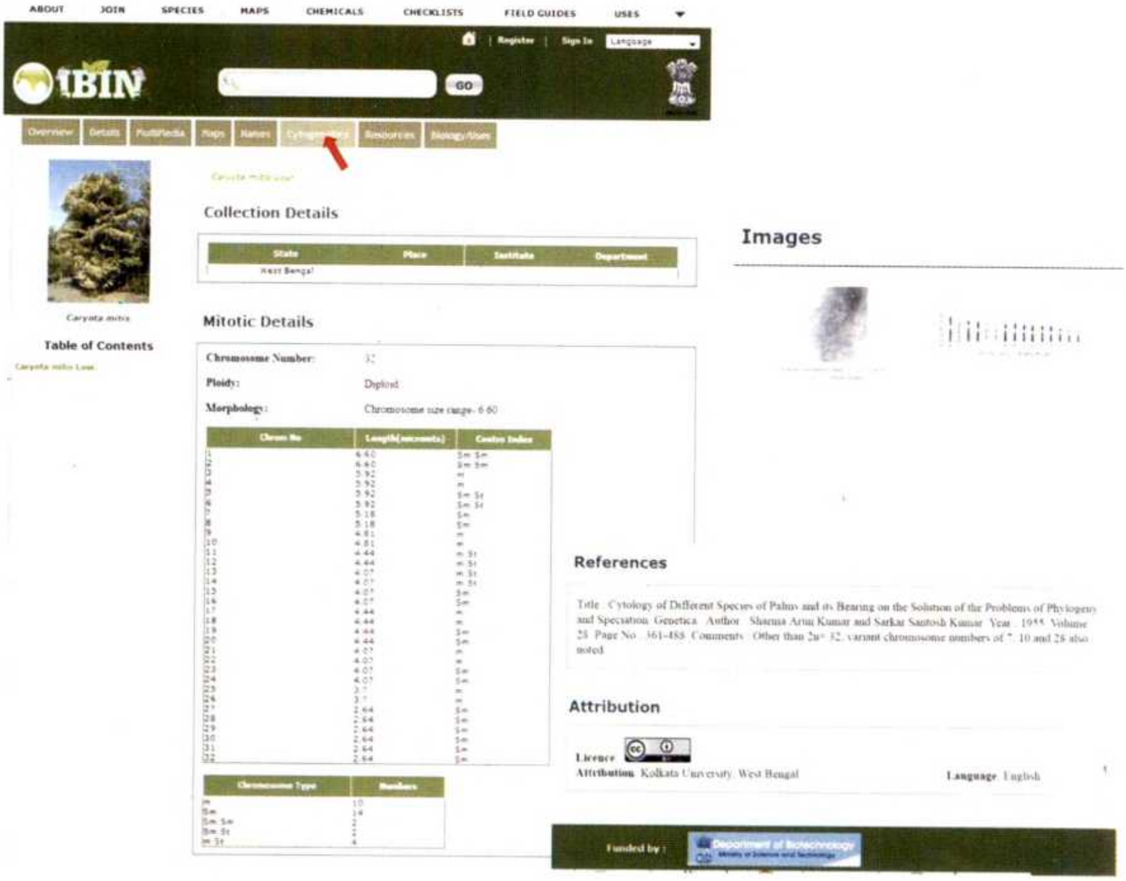


Table of Contents

Caryota mitis Lour.

Collection Details

State	Place	Institute	Department
West Bengal			

Mitotic Details

Chromosome Number: 32

Ploidy: Diploid

Morphology: Chromosome size range- 6.60

Chrom No	Length(micrometer)	Centro Index
1	6.60	Sm Sm
2	6.60	Sm Sm
3	5.92	m
4	5.92	m
5	5.92	Sm St
6	5.92	Sm St
7	5.18	Sm
8	5.18	Sm
9	4.81	m
10	4.81	m
11	4.44	m St
12	4.44	m St
13	4.07	m St
14	4.07	m St
15	4.07	Sm
16	4.07	Sm
17	4.44	m
18	4.44	m
19	4.44	Sm
20	4.44	Sm
21	4.07	m
22	4.07	m
23	4.07	Sm
24	4.07	Sm
25	3.7	m
26	3.7	m
27	2.64	Sm
28	2.64	Sm
29	2.64	Sm
30	2.64	Sm
31	2.64	Sm
32	2.64	Sm

Chromosome Type	Numbers
m	10
Sm	14
Sm Sm	2
Sm St	2
m St	4

Images

References

Title : Cytology of Different Species of Palms and its Bearing on the Solution of the Problems of Phylogeny and Speciation Genetica . Author : Sharma Arun Kumar and Sarkar Santosh Kumar Year : 1955 Volume : 28 Page No : 361-488 Comments : Other than 2n= 32, variant chromosome numbers of 7, 10 and 26 also noted.

Attribution

Licence

Attribution Kolkata University West Bengal

Language English

2. **Centre of Excellence on Translational research of transgenic crops** supported by DBT, Govt. of India- **DBT funded new Research facility (**Coordinated by Dr. Karabi Datta and Prof. Swapan Kumar Datta**):**

This centre is devoted to translation of novel gene source into products of economic value employing available genetic tools. It is running for more than 7 years with the financial support of more than Rs 7.0 Cr. This facility is equipped with sophisticated modern instrumentations. It helped the department for development of human resources with modern science of Genomics, Genetics and Molecular Biology. PhD students are working on this project and several Post-docs are also attached with this programme. Efficient genetic transformation of a number of crops (rice, chickpea, jute, potato etc.) has been established and a number of genes/promoters are being cloned and validated in crops for the improvement of traits such as nutrition value, disease resistance, salt and drought stress tolerance etc. Research papers have appeared in International journals like, Science, Plant Biotechnology Journal, PLoS ONE, Plant Cell Tissue Organ Culture, Molecular Plant Pathology, Plant Cell Reports, Food Chemistry etc. Earlier the group published research papers in Nature, Nature Biotechnology, Science, TAG, Plant Journal, Annals of Botany, Phytochemistry, Journal of Plant Physiology, Molecular Breeding, MGG etc.

Prof. Suranjan Das, Vice Chancellor, University of Calcutta and Padmabhusan Prof. Arun Kumar Sharma, University of Calcutta have jointly inaugurated the facility of "Translational Research on Transgenic Crops" at Annex building, Department of Botany, University of Calcutta on 28th October, 2013, the centenary year of the Department. Prof. K. Vijay Raghavan, Secretary, DBT joined the event by Skype video conferencing.

Continuation of the centre for such research facility with the support from DBT and University of Calcutta will be very much useful for the academic interest of the University.

Molecular Biology Laboratory

Green House and Tissue Culture Room

3. Microalgal Culture, Cultivation and Biomass Processing Unit

(Teacher–in-charge-Prof. R. Pal)

This unit was established on 2011 with the support of CSIR-NIMTLI program and UGC-UPE projects to Prof. Ruma Pal. It was officially inaugurated by Prof Dhrubojyoti Chattopadhyay, the then Pro Vice Chancellor, Academy, University of Calcutta.

A large number of potential algal strains from different habitats are used to collect and are maintained in uni-algal condition in this unit for further biotechnological exploitation. Almost 50 taxa from different groups of algae like, Cyanobacteria, Chlorophyceae, Bacillariophyceae, Euglenophyceae are being maintained. The samples were collected and isolated from different ecological niches of West Bengal like eutrophic wetlands, Arsenic contaminated area of West Bengal, chemical industry and tannery waste, coastal areas and the Sunderbans. The algae are maintained in unialgal condition both in stab and liquid culture in culture collection unit. Mass propagation of economically potential genera like *Spirulina*, *Phormidium*, *Chlorella*, *Euglena* and *Navicula* cultivation in large tank culture and photobioreactor based cultivation are in practice. Experimental set up have been designed indigenously and established including closed type reactor for carbon sequestration program. Biomass collection, drying and storage are regularly being done for future use.

CENTENARY CELEBRATION — A PICTORIAL DOCUMENTATION

CENTENARY CELEBRATION COMMITTEE

Chairman : Prof. A.K. Sharma

Jt. Conveners : Prof. N.D. Paria
Prof. S. Jha
Prof. R. Pal

Treasurer : Prof. A. Mukherjee

Jt.Treasurer : Prof. A.K. Biswas
Prof. S. Bera

Members : Prof. A.K. Pal, Prof. B. De, Prof. S. Mukhopadhyay, Prof. K. Acharya, Dr. B.Chaubey, Prof. R. Kundu, Dr. K. Datta, Dr. M.Poddar Sarkar, Dr. M. Bandyopadhyay, Dr. S. Kundu, Dr. D. Maity, Dr. S. Ray, Prof. R.K. Chaudhuri, Prof. N. Samajpati, Prof. S. Mukherji, Dr. I. Chaudhuri

OPENING CEREMONY

LIGHTING OF LAMP

AND

HONORING DIGNITARIES

HONORING EX-TEACHERS

ALUMNI MEMBERS

ALUMNI

MEMBERS

CULTURAL PROGRAMS

WITH
VOLUNTEERS

WORKSHOP I

BSC PRACTICAL FOR COLLEGE TEACHERS

25TH - 27TH OCTOBER, 2013.

CONVENERS

Prof. A. Mukherjee

Prof. A.K. Biswas

TOTAL NUMBER OF PARTICIPANTS : 54 (COLLEGE TEACHERS)

RESOURCE PERSONS INVITED : Dr. A.K. Ghosh, Dr. (Ms) N. Chakrabati, Dr. (Mrs) S. Ghosh (City College), Dr (Mrs) M. Mandal, Dr. (Mrs) S. Bhattacharyya (Scottish Church College), Dr. (Mrs) M. Das (Gurudas College), Dr. (Mrs) S. Sinha, Dr. (Mrs) R. Saha (Lady Brabourne College), Dr. D. Das, Dr. A.K. Dutta (Serampore College), Dr. (Mrs) S. Kumar (Rai) (Vivekananda College, Thakurpukur), Dr. (Mrs) Soma Halder Paul (Ashutosh College)

AREA COVERED

- **Plant Biochemistry**
- **Plant Physiology**
- **Anatomy**
- **Pharmacognosy**
- **Cell Biology and Genetics**
- **Biometry**
- **Microbiology**
- **Plant Pathology**

WORKSHOP II

CRYPTOGAMIC BOTANY FROM CURRICULUM TO APPLICATION

20TH - 26TH NOVEMBER, 2013.

CONVENERS

Prof. K. Acharya

Prof. R. Pal

Prof. S. Bera

TOTAL NUMBER OF PARTICIPANTS : 18

(University, College Teachers and Research Scholars)

RESOURCE PERSONS INVITED :

Prof. J. West, University of Melbourne, Prof. G. Rengaswamy, Program Co-Ordinator and Head, Department of Botany, Madras University, Chennai; Prof. B. N. Chakraborty, NBU; Dr. D. K. Singh, BSI; Prof. S.P. Adhikary, Visva Bharati; Prof. S. Ray, Visva-Bharati, Santiniketan; Dr. J.P. Keshri, BU; Dr. Ruma Pal, C.U.; Dr. K. Acharya, C.U.; Dr. S. Kundu, C.U.; Dr. M. Bandhapadhyay, C.U.; Prof. S. Bera, C.U.

AREA COVERED :

- **Algal Diversity study.**
  - a. Identification of microalgae and seaweeds.
  - b. Phytoplankton sampling and identification.
  - c. Molecular study and RAPD analysis of green algae.
- **Isolation, culture and cultivation of micro-algae.**
- **Fungal diversity study.**
- **Moss Identification.**
- **Studies on fossil cryptogams.**

WORKSHOP III

CHROMATOGRAPHY –THE CATAPULT FOR UNRAVELLING THE FACTS OF NATURE

26TH - 27TH DECEMBER, 2013.

CONVENERS

Dr. Mousumi Poddar Sarkar

Dr. Maumita Bandhyopadhyay

A Training Programme on
HPTLC, HPLC, GC and GCMS
funded by
DST-PURSE, Govt. of India

Supported by
Agilent Technologies
India Pvt. Ltd.

Instrumental Facilities by
UGC-CAS (HPTLC)
DST-FIST (HPLC, GC, GCMS)

TOTAL NUMBER OF PARTICIPANTS : 76
(Teachers, Scientific Staff of Industry, Students and Research Scholars including 15 in-house research-scholars from Botany, Biochemistry and Environmental sc.)

RESOURCE PERSONS INVITED :

PROF. ASISH KR. SEN (Chief Scientist) Chemistry
Indian Institute of Chemical Biology (CSIR), Kolkata

DR. MAHUA GHOSH
Dept. of Chemical Technology, University of Calcutta, Kolkata.

AREA COVERED :

- Session on different elements and theories of separation techniques of biomolecules
- Hands-on-training programme on HPTLC, HPLC, GC and GCMS
- A DVD containing literature and guideline for operation of these instruments has been distributed to the participants.

WORKSHOP IV

HANDS-ON TRAINING ON PALAEOBOTANICAL AND PALYNOLOGICAL TECHNIQUES

21TH - 28TH APRIL, 2014

CONVENERS

Prof. Subir Bera

Dr. Ashalata D'Rozario

RESOURCE PERSONS INVITED :

Prof. M. Banerjee, Professor (Retd.), C.U.; Prof. S. Chanda, (Retd.), Bose Institute, Kolkata; Prof. A. Sarkar, IIT, Kharagpur; Dr. Tapan Chakraborty, ISI; Prof. Swati Gupta Bhattacharya, Bose Institute; Dr. Ruby Ghosh, BSI of Palaeobotany, Lucknow; Dr. Bharati Nandi, (Retd.), University of Kalyani; Dr. Suryendu Dutta, IIT, Mumbai; Prof. Subir Bera, C.U.; Prof. P.K. Pal, University of Burdwan and Dr. Prakash Karmakar, Vidyasagar University, Dr. [illegible]oma Roy, Central Forensic Laboratory, Kolkata; Prof. Sudhendu Mandal, Visva Bharati University, Prof. Kashinath Bhattacharyya, Visva Bharati University, Speaker: Dr. Sudha Gupta, University of Kalyani; Dr. N.C. Mehrotra, (Retd.) Director, BSI of Palaeobotany, Lucknow.

AREAS COVERED :

Palynological Analysis-

- Neo-palynology (for palynotaxonomy, melissopalynology, aerobiology and forensic research): Acetolysis technique;
- Palaeopalynology (extraction of palynomorphs and other microfossils from different sedimentary strata and fossil fuels): Maceration technique, Heavy Liquid separation and isolation of megaspores; Mega fossil studies: Morphometry, Thin section and Peel techniques; Isolation of cuticle for taxonomic and palaeomy-cological research; Determination of PCO$_2$ concentration using stomatal index analysis; Study of Plant-Animal interaction in the past; Isolation and analysis of opal silica bodies (Phytoliths); Analysis and quantification of past climate: LMA, NLR, CLAMP and Co-existence

WORKSHOP V

BASIC TECHNIQUES OF MOLECULAR BIOLOGY

14TH – 21ST MAY, 2014.

CONVENER

Prof Rita Kundu

TOTAL NUMBER OF PARTICIPANTS : 24
(University, College Teachers and Research Scholars)

RESOURCE PERSONS INVITED :

Prof. Dhrubajyoti Chattopadhyay Pro VC Academic affairs, CU.
Prof. A.N. Lahiri Majumdar, Raja Ramanna Fellow, Bose Institute
Prof Amita Pal, Bose Institute

AREA COVERED :

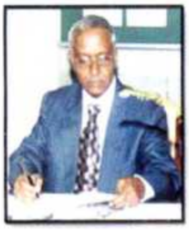
- **RNA isolation**
- **RT PCR**
- **DNA extraction**
- **Gene Amplification**
- **Gene cloning**
- **Western blot**
- **Ingel isozyme analysis**

WORKSHOP VII

TAXONOMY AND BIOSYSTEMATICS OF VASCULAR PLANTS

14TH – 22ND JULY, 2014

CONVENERS



Prof N.D. Paria

Dr. D. Maity

TOTAL NUMBER OF PARTICIPANTS : 45

RESOURCE PERSONS INVITED :

Prof. C.R. Babu, Dr. V. Kumar, Dr. P. Singh, Prof. A.K. Pandey, Prof. S. R. Yadav, Prof. M. Sabu, Dr. P. Lakshminarasimhan, Prof. S. Mandal, Prof. A. P. Das, Prof. G.G. Maiti, Prof. S. Banerji, Prof. A. Mukherjee, Prof. N.D. Paria, Dr. D. Maity & others

AREAS COVERED : Morphology, Anatomy, Palynology, Seedling Morphology, Population Concept and Phytosociology, Molecular Systematics, Floristics (Including Herbarium Technique), Biodiversity, Numerical Taxonomy, ICN-Theory & Practical, Ethnobotany, Phytogeography & Ende-mism, Application of GIS & Remote Sensing Techniques in Botanical Study, Taxonomy of Gymnosperms, Taxonomy of Pteridophytes

INTERNATIONAL SYMPOSIUM I
TRENDS IN PLANT SCIENCE RESEARCH
15TH - 16TH FEBRUARY, 2014.

CONVENERS

Prof. Sandip Mukhopadhyay

Prof. Anita Mukherjee

TOTAL NUMBER OF PARTICIPANTS : 138
(University, College Teachers and Research Scholars)
Outstation Participants 20

Resource persons INVITED:
Prof. Govindjee, University of Illinois Urbana-Champaign, Prof. K.N. Gandhi Harvard University, Prof Sudhir K Sapory JNU, Prof K NG Ganeshaiah, GKVK Prof LC Rai, BHU, Prof Akhilesh K Tyagi NIPGR, Dr Manoj Prasad NIPGR

AREA COVERED : All Fields of Plant Science

INTERNATIONAL SYMPOSIUM II

ROLE OF FUNGI AND MICROBES IN THE 21ST CENTURY – A GLOBAL SCENARIO

20TH – 22ND FEBRUARY, 2014.

CONVENERS

Prof. N. Samajpati (Convener)

Dr. A.K. Manna (Jt. Convener)

TOTAL NUMBER OF PARTICIPANTS : 350

(University/College Teachers, Scientists from Research Institutes and Research Scholars)

RESOURCE PERSONS INVITED:

Dr. Mangala Rai, Agricultural Advisor to the Hon'ble Chief Minister Bihar and Former Secretary, DARE and DG, ICAR, Prof Anita Mukherjee, HOD Botany, C.U. Prof. K.R.Samaddar, Former Head, Dept of Botany, Kalyani University, Prof. R.K. Mittal, Vice Chancellor, Rajendra Agricultural University, Pusa, Bihar and President IMS Prof Balen Nandi Former Head, Dept of Botany Burdman Univ. Prof C Manoharachary, Osmania University, Hyderabad, Prof DK Jha Assam University, and many others

AREA COVERED :

- **Microbial diversity, evolution and conservation**
- **Industrial and environmental microbiology**
- **Pathogenic microorganisms and their management**
- **Mushrooms, Mycorrhizae and Endophytes**
- **Microbial biotechnology**
- **Microbes in Human Health**

NATIONAL CONFERENCE ON CURRENT RESEARCH IN MICROBIOLOGY
4TH APRIL, 2014
IN COLLABORATION WITH
PROF. A. K. CHANDRA MEMORIAL COMMITTEE AND
PROF. R. P. PURKAYASTHA MEMORIAL COMMITTEE

CONVENERS

Prof. N.D. Paria (Convener) **Dr. Swapan Bhattacharya (Jt. Convener)**

TOTAL NUMBER OF PARTICIPANTS : 93
(University, College teachers, Research scholars and Students)

RESOURCE PERSONS INVITED :
Prof. Bikash Ranjan Pati, Vidyasagar University; Dr. Triveni Krishnan, National Institute of Cholera & Enteric Diseases, Kolkata; Prof. B. N. Chakraborty, North Bengal University; Prof. Akhil C. Banerjea, National Institute of Immunology, New Delhi; Prof. Sujoy Das Gupta, Bose Institute.

THEME AREAS : Agricultural Microbiology, Environmental Microbiology, Medical Microbiology

AREA COVERED :

- Insights into the genetic diversity of novel gastroenteritis viruses in Kolkata, India.
- Molecular events in recognition of fungal pathogens, activation of defense response and strategies for crop health management.
- HIV-1 Pathogenesis by accessory proteins of HIV-1 and Role of (Micro-RNAs) and RNAi-suppressors in HIV-1 infection.
- Microbacterial plasmids and phages as evolutionary paradigms.

NATIONAL SYMPOSIUM

PLANT DIVERSITY : STRUCTURE, FUNCTION, UTILIZATION AND CONSERVATION

4TH-6TH DECEMBER , 2014.

CONVENERS

Prof. N.D. Paria
Convener

Prof. Anita Mukherjee
Jt. Convener

Prof. Sandip Mukhopadhyay
Jt. Convener

Dr. Parimal Nag
Jt. Convener

AREAS TO BE COVERED :

- Microbes, Algae, Fungi and Higher Cryptogams
- Flowering Plants and Systematics
- Biodiversity: Documentation and Resource Management
- Paleophytodiversity, Ecology and Phytogeography
- Cell biology, Chromosome Research, Genetics and Biotechnology
- Phytochemistry, Stress Physiology and Biochemistry

CENTENARY CELEBRATION

SCIENCE DAY CELEBRATION OUR PLANT : OUR PLANET

28TH FEBRUARY, 2014

IN COLLABORATION WITH ALUMNI ASSOCIATION

CONVENERS

Dr. Ila Chudhuri

Dr. S. Ray

Dr. D. Maity

TOTAL NUMBER OF PARTICIPANTS : 65

RESOURCE PERSONS INVITED :

Prof. Kanak Ranjan Samaddar

AREA COVERED :

Plant Diversity, Sustainable Development

BRIKSHAROPAN : TREE PLANTATION

21ST SEPTEMBER, 2013

ORGANISED BY

Alumni Association : Post Graduate Department of Botany

MEMBERS PRESENT :

Prof. A.K. Sharma, President of the Association, Prof. D.J. Chattopadhyay, Pro-Vice Chancellor, Academic, All E.C. members including Senior alumni like, Prof. Sumitra Sen, Dr. Salil K. Chaudhuri, Prof. Rajat K. Chaudhuri, and Dr. Karabi Dutta

TOTAL PLANTATION : 20

Prof A.K.Sharma, President of the Association planted *Bauhimia purpurea* Linn.

Prof. D.J. Chattopadhyay, Pro V.C. Academic planted *Magnolia grandiflora* Linn.

Other samplings planted included *Dillenia indica, Caesalpinia pulcherrima*, *Ravenala madagascariensis*, *Saraca asoka*, *Mimusops elengi*

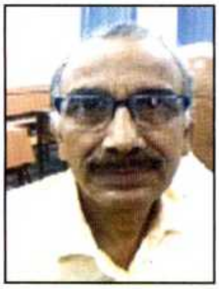
PLEASURE TRIP TO SUNDERBAN

8TH AND 9TH OF FEBRUARY, 2014

ORGANISED BY

Alumni Association : Post Graduate Department of Botany

CONVENERS



P. Gangulee

S.N. Sarkar

Dr. A. Bhadra

TOTAL NO. OF PARTICIPANTS : 31 (Alumni Members)

THE JOURNEY :

The trip started by boarding a Luxury bus from Science College for Godkhali on 8th at 8:00 A.M. A motor launch was taken form Godkhali to Pakhirala. Post lunch a tour was taken to Sajnekhali to visit the museum and the Crocodile Project. After returning back to Pakhirala, a cultural programme was organised involving the participation of Dr. Pranab Kumar Bandyopadhyay, Prof. Prabir Ganguly, Dr. Susanta Ghosh. On 9th after breakfast a visit was made to the tiger reserves like Dobaki, Sudhanyakhali etc. The lunch was served on Board. In the evening returned back to Godkhali and then by bus to Kolkata.

The tour was organized by one of our alumnus Dr. Aditi Pal

CENTENARY SPORTS

25TH JANUARY, 2014

CONVENER

Dr. Maumita Bandopadhyay

TOTAL NUMBER OF PARTICIPANTS : 20

(University College Teachers, and Research scholars, Students and alumni members)

VENUE : Ballygunge Government High School Playground

EVENTS :

Cricket match Played between the teams with present students and research Scholars on one hand and past students, Scholars and teachers on the other hand in a 20 over per side format

The participants of the Alumni were declared winners